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NAVAER 01-60JKE-502

6 86

## Handbook Maintenance Instructions

*NAVY MODEL*

FJ-4B  
AIRCRAFT

## SECTION I GENERAL INFORMATION

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## Introduction to SECTION I

THIS HANDBOOK IS ONE OF A SERIES OF TEN which contain instructions required by using activities for the maintenance of Model FJ-4B aircraft. These are systems type handbooks. Each system is covered completely in a particular handbook. This includes all hydraulic, pneumatic, mechanical and electrical portions of the system. This has been done in order to assist the mechanic in becoming familiar with and in maintaining all phases of each system.

The "General Information" handbook is designed for the plane captain and for the servicing mechanic. All the information necessary for complete servicing and handling of the aircraft is contained in Section I.

This handbook does not contain instructions for the overhaul of components. Such instructions are contained in separate handbooks of overhaul instructions for the individual components.

Instructions for the repair of aircraft structure are contained in the Handbook of Structural Repair (NAVAER 01-60JKD-503) for these aircraft.

Data necessary for obtaining replacement parts and for complete identification of parts are contained in the Illustrated Parts Breakdown (NAVAER 01-60JKD-504) for these aircraft.

Weight and Balance Data are found in the applicable AN 01-1B-40 handbook for each of these aircraft.

To identify and obtain these publications and handbooks covering separate items of equipment, refer to the Naval Aeronautic Publications Numerical Index (NAVAER 00-500).

BuAer Serial Numbers 139531 through 139555, 141444 through 141489 and 143493 through 143643 have been assigned to the FJ-4B. In addition, a lower case letter has been made a part of each serial number as it is painted on the aircraft. These lower case letters have been assigned to blocks of serial numbers as follows:

| SERIAL NUMBER         | LETTER |
|-----------------------|--------|
| 139531 through 139555 | i      |
| 141444 through 141489 | j      |
| 143493 through 143542 | k      |
| 143543 through 143593 | l      |
| 143594 through 143643 | m      |

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# FJ-4B *Fury*



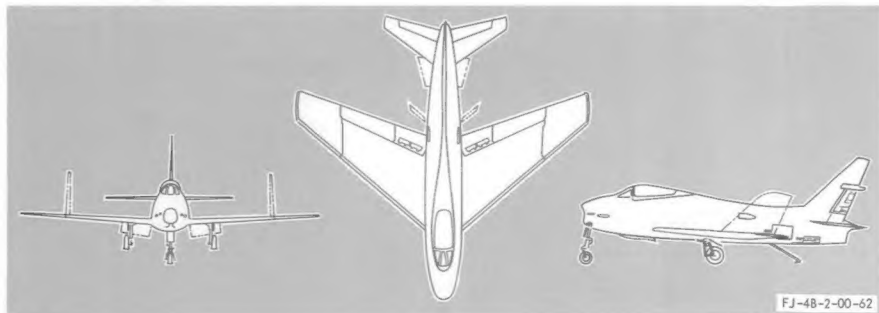
Figure No. 1-1. FJ-4B Airplane

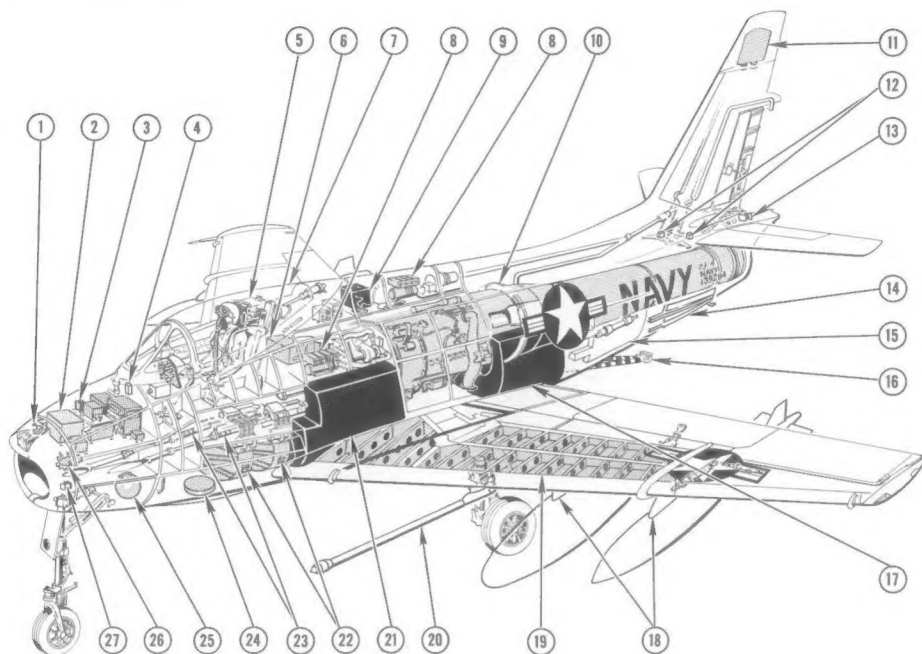


**GENERAL DESCRIPTION****1-1. GENERAL DESCRIPTION.**

1-2. The FJ-4B "Fury" airplane (figure 1-1) is a single-place, low-wing attack airplane with high-performance fighter capabilities. Identifying characteristics are a tri-cycle landing gear, a sliding canopy, a sweptback wing and a sweptback horizontal stabilizer. The horizontal stabilizer is used as a hydraulically operated control surface to aid in longitudinal control. Additional characteristics of the airplane include: (1) a longitudinal control position trim wheel on the pilot's control stick which allows the pilot to easily select extremely small trim changes, (2) elevator to horizontal stabilizer gearing to reduce longitudinal sensitivity, (3) a rudder boost control system, (4) a set of spoilers in the wing flaps to aid in lateral control and (5) a double set of speed brakes to control desired drag. The airplane is powered by a J65-W-4B/16A Sapphire jet engine and the fuselage is so constructed that the rear section can be removed to allow quick engine change. The main landing gear assemblies consist of a knuckle-type gear with a fixed post. The assemblies retract inboard to an enclosed position within the wing and fuselage. The cockpit is equipped with emergency escape provisions that jettison the bubble canopy and eject the seat free from the airplane. The airplane, designed for carrier operation, has a catapult hook and holdback fittings for take-off and an arresting gear hook for landings. The wing outboard panels can be folded for shipboard storage. The wing inboard panels are designed and constructed as a wet wing, with the skin on the panels precision machined and sealed to form the outer shell of an integral fuel

cell. Two fuel cells (a forward cell which is a self-sealing, bladder-type and an aft cell which is a bladder-type) are located in the fuselage. Provisions are incorporated within the airplane for installation of radar or LABS equipment. The airplane is equipped with an omni-range receiver (with provisions for AN/ARN-21 included), a uhf command radio set, an automatic direction finder, radar identification equipment and an armament control system. The airplane has provisions for carrying four Mark 12 guns with 576 rounds of 20mm ammunition. Other armament provisions include three armament stations under each wing for carrying bombs, rockets and missiles. Provisions have been made for carrying the Mark 7, Mark 12 or Mark 28 store at armament station No. 2. To provide long-range capabilities, several combinations of auxiliary fuel tanks may be carried under the wing; two 200-gallon auxiliary fuel tanks may be carried at the No. 2 and No. 5 armament stations and two 150-gallon tanks may be carried at the outboard armament stations. These tanks can be pressure refueled with the airplane's fuel system and can also be in-flight refueled. Provisions have been incorporated in the universal pylon for installation of the buddy tanker package. Approximately 568 gallons of fuel are transferable from the buddy tanks to a receiver, using a drogue and probe hookup. Also, provisions for transferring tanker airplane fuel to the buddy tank and buddy tank fuel to the tanker airplane are installed. FJ-4B airplanes are designated with BuAer Serial Numbers 139531i through 139555i, 141444j through 141489j and 143493k through 143643m.





- |    |  |    |                              |
|----|--|----|------------------------------|
| 1  | ANGLE-OF-YAW DETECTOR                        | 15 | FORWARD SPEED BRAKES         |
| 2  | AERO 18C LABS OR APG-30A RADAR               | 16 | ARRESTING GEAR               |
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| 7  | CANOPY                                       | 21 | FORWARD FUEL CELL            |
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| 13 | DIPOLE ANTENNA                               | 27 | DIPOLE ANTENNA               |
| 14 | AFT SPEED BRAKES                             |    |                              |

FJ-4B-2-00-61

Figure No. 1-2. Interior Arrangement



| TYPE OF ARMAMENT OR STORE                                   | STA 6 | STA 5 | STA 4 | STA 3 | STA 2 | STA 1 |
|---|-------|-------|-------|-------|-------|-------|
| 5-INCH HVAR   |       |       |       |       |       |       |
| AERO 6 POD<br>SEVEN 2.75-INCH ROCKETS                       |       |       |       |       |       |       |
| AERO 7 POD<br>NINETEEN 2.75-INCH ROCKETS                    |       |       |       |       |       |       |
| AERO 9 POD<br>NINETEEN 2.00-INCH ROCKETS                    |       |       |       |       |       |       |
| AERO 10 POD<br>FOUR 5-INCH HVAR                             |       |       |       |       |       |       |
| SIDEWINDER  |       |       |       |       |       |       |
| 260-LB BOMB   |       |       |       |       |       |       |
| 500-LB BOMB   |       |       |       |       |       |       |
| 1000-LB BOMB  |       |       |       |       |       |       |
| 2000-LB BOMB  |       |       |       |       |       |       |
| 150-GALLON DROP TANK (OUTBD)<br>200-GALLON DROP TANK (INBD) |       |       |       |       |       |       |
| BUDDY TANKER  |       |       |       |       |       |       |
| MK 7, MK 12,<br>MK 28 STORES                                |       |       |       |       |       |       |

FJ-48-2-00-63

Figure No. 1-3. External Stores

Section I  
General Description

NAVAER 01-60JKE-502

**PRINCIPAL DIMENSIONS****1-3. PRINCIPAL DIMENSIONS.**

1-4. Airplane principal dimensions are taken with the landing gear struts and tires inflated to the correct pressures. (See figure 1-4.)

**GENERAL**

|   |           |
|---|-----------|
| Span .....  | 39.11 ft  |
| Length (over-all) .....                             | 36.31 ft  |
| Length (over-all on the ground) .....               | 37.18 ft  |
| Height (tip of vertical stabilizer to ground) ..... | 13.88 ft  |
| Wings folded  |           |
| Width .....   | 27.48 ft  |
| Height .....  | 9.79 ft   |
| Weight empty .....                                  | 13,704 lb |
| Take-off gross weight normal .....                  | 20,446 lb |
| Maximum alternate gross weight .....                | 26,605 lb |

**WINGS**

|  |                       |
|--|-----------------------|
| Type .....   | Low wing              |
| Airfoil section  |                       |
| Root .....   | Modified NACA-64A-006 |
| Tip .....  | Modified NACA-64A-006 |
| Chord at root .....                                      | 13.38 ft              |
| Chord at tip .....                                       | 3.96 ft               |
| Incidence at root .....                                  | +1 deg                |
| Incidence at tip .....                                   | -3 deg                |
| Dihedral .....   | 3 deg                 |
| Sweepback at station 129.14 (wing 25 percent line) ..... | 35 deg                |
| Aspect ratio .....                                       | 4.480                 |

**HORIZONTAL STABILIZER**

|                                 |                       |
|---------------------------------|-----------------------|
| Span .....                      | 13.16 ft              |
| Maximum chord .....             | 5.34 ft               |
| Chord at tip .....              | 2.26 ft               |
| Incidence (adjustment) .....    | 6 deg up, 14 deg down |
| Dihedral .....                  | 0 deg                 |
| Sweepback of leading edge ..... | 35 deg                |
| Aspect ratio .....              | 3.784                 |

**VERTICAL STABILIZER**

|   |          |
|---|----------|
| Height (from fuselage reference line) ..... | 10.21 ft |
| Chord at fuselage reference line .....      | 7.26 ft  |
| Chord at tip .....                          | 1.73 ft  |

**FUSELAGE**

|   |          |
|---|----------|
| Width (maximum) .....                           | 5.00 ft  |
| Height (fuselage bottom to top of canopy) ..... | 7.03 ft  |
| Length (without empennage) .....                | 35.68 ft |

**AREAS**

|  |              |
|--|--------------|
| Wing (including ailerons, flaps and 62.6 sq ft of fuselage) .....                    | 338.66 sq ft |
| Ailerons (both) .....  | 30.34 sq ft  |
| Flaps (both, including spoilers) .....   | 22.56 sq ft  |
| Spoilers .....   | 3.04 sq ft   |
| Horizontal stabilizer (including area covered by vertical stabilizer) .....          | 49.90 sq ft  |
| Elevators (both) .....   | 13.68 sq ft  |
| Vertical stabilizer (including area covered by fuselage, excluding dorsal fin) ..... | 34.72 sq ft  |
| Rudder (including tab) .....   | 5.26 sq ft   |
| Rudder trim tab .....  | 0.80 sq ft   |
| Speed brakes (effective frontal area) .....  | 26.06 sq ft  |

**ANGLE OF INCIDENCE** - A fixed angle between the plane of the wing chord and the line of thrust or any other longitudinal line which is level when the fuselage is level longitudinally.

**ASPECT RATIO** - The ratio of the square of the maximum span to the total area of the airfoil.

**AXIS OF SYMMETRY CENTERLINE** - ( $\bar{C}$ ) A vertical plane passing through the longitudinal axis of the airplane, and about which both halves of the airplane are symmetrical.

**BUTTOCK LINE** - BL

**BUTTOCK PLANE** - BP - A vertical plane cutting the fuselage parallel to the axis of symmetry ( $\bar{C}$ ).

**CHORD** - An arbitrary reference line from which the ordinates and angles of an airfoil are measured. It is usually the straight line between the leading and trailing edges of the wing.

**DIHEDRAL** - The acute angle between the wing reference plane and any water plane.

**FUSELAGE REFERENCE LINE** - FRL

**FUSELAGE REFERENCE PLANE** - FRP A horizontal reference plane through the fuselage from which all basic vertical dimensions are taken.

**LINE OF THRUST** - Direction in which jet engine exerts its power. Centerline of force.

**PERCENTAGE PLANES AND STATIONS** - A percentage plane of an airfoil is measured from the leading edge at the root chord and tip chord. The plane running between these two points and perpendicular to the airfoil reference plane is called a percentage plane. Stations measured along this plane are called percentage stations.

**STATION** - A section or position a certain number of inches from a given plane. This given plane is always designated as "station 0."

**WATER LINE** - WL

**WATER PLANE** - WP - A horizontal reference plane cutting the ship parallel to the fuselage reference plane.

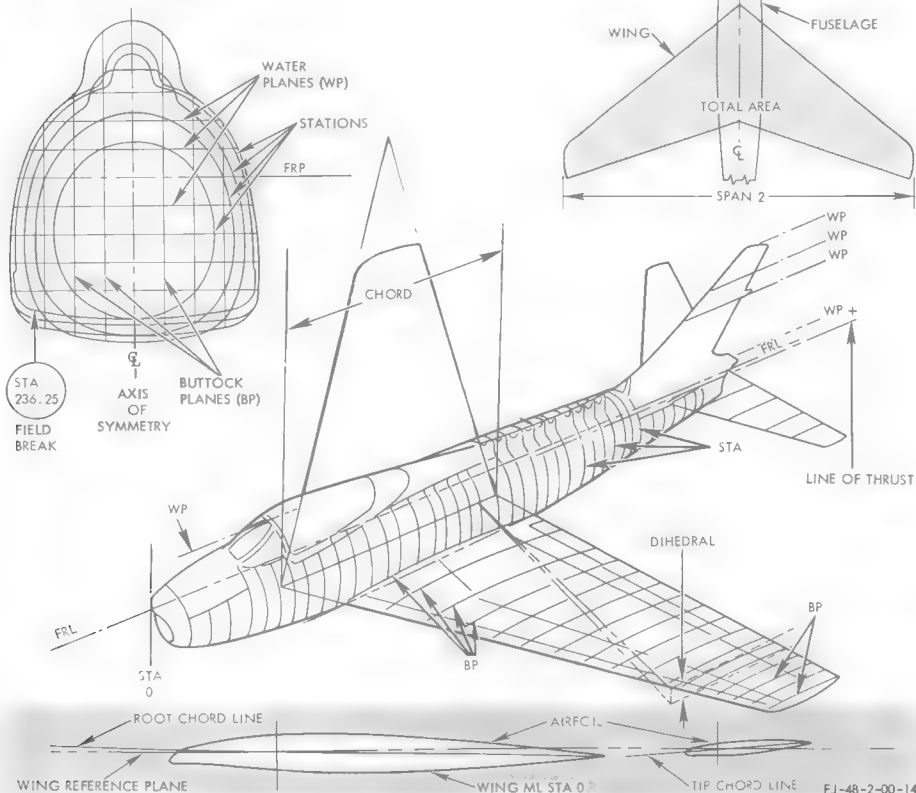
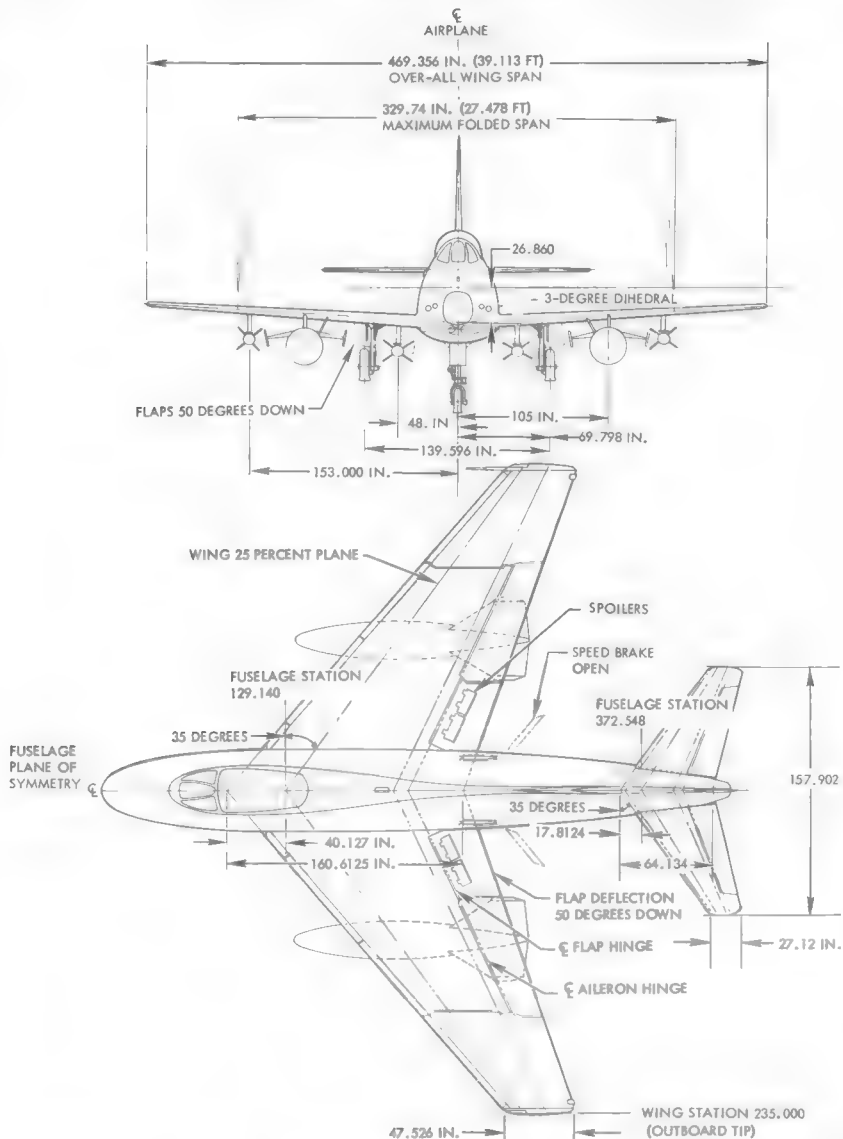


Figure No. 1-4. Airplane Dimensions (Sheet 1)



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Figure No. 1-4. Airplane Dimensions (Sheet 2)

## NAVER 01-60JKE-502



Revised 1 February 1958





## NAVAER 01-60JKE-502



**Figure No. 1-5. Airplane Stations (Sheet 2)**

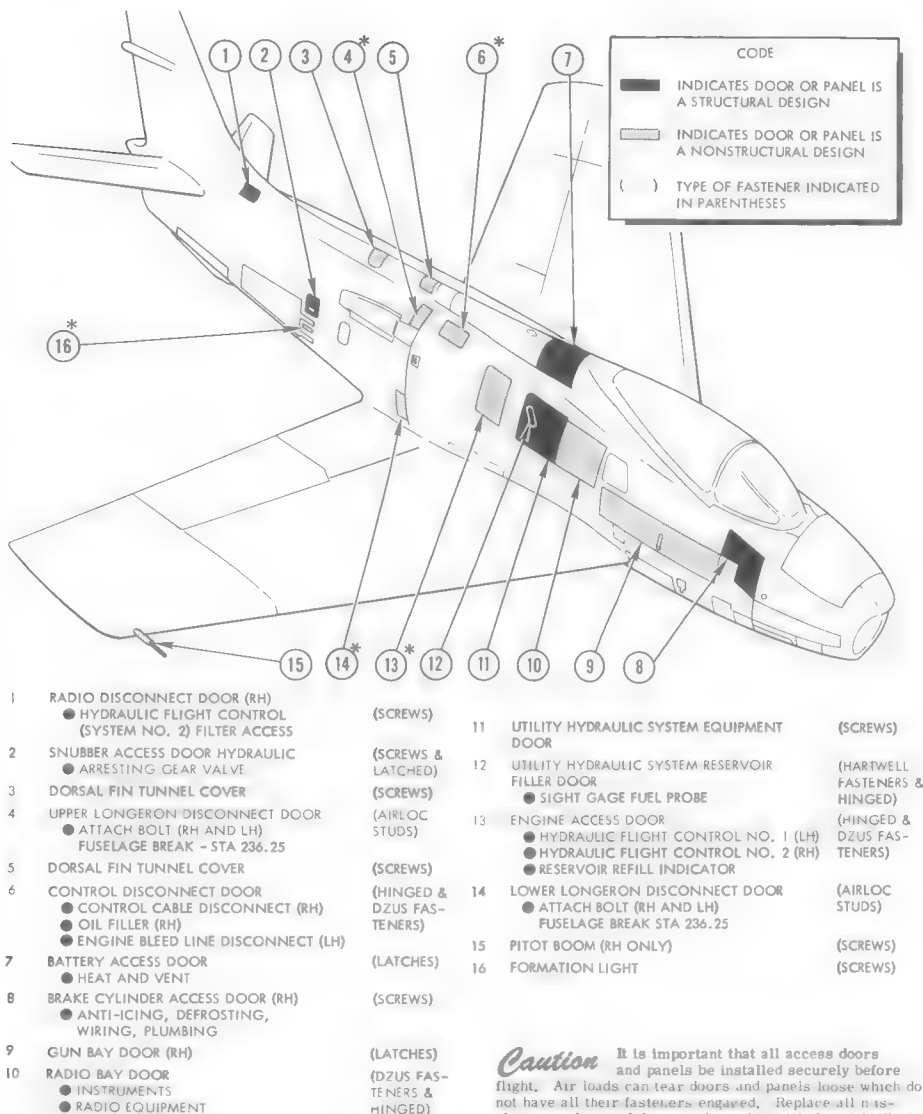
**ACCESS AND INSPECTION PROVISIONS****1-5. ACCESS AND INSPECTION PROVISIONS.**

1-6. The cockpit may be entered from either side of the airplane where canopy controls and steps are provided. Cockpit entry and manual opening of the canopy are shown in figure 1-6. Access and inspection provisions are shown in figure 1-7. Further information on access door fasteners and access door weather sealing may be found in figures 1-8 and 1-9.



FJ-48-2-00-16

Figure No. 1-6. Entry Provisions



\* TYPICAL BOTH SIDES

**Caution** It is important that all access doors and panels be installed securely before flight. Air loads can tear doors and panels loose which do not have all their fasteners engaged. Replace all misshapen or damaged doors and panels which do not fit flush with the airplane skin.

FJ-48-2-00-17

Figure No. 1-7. Access and Inspection Provisions (Sheet 1)

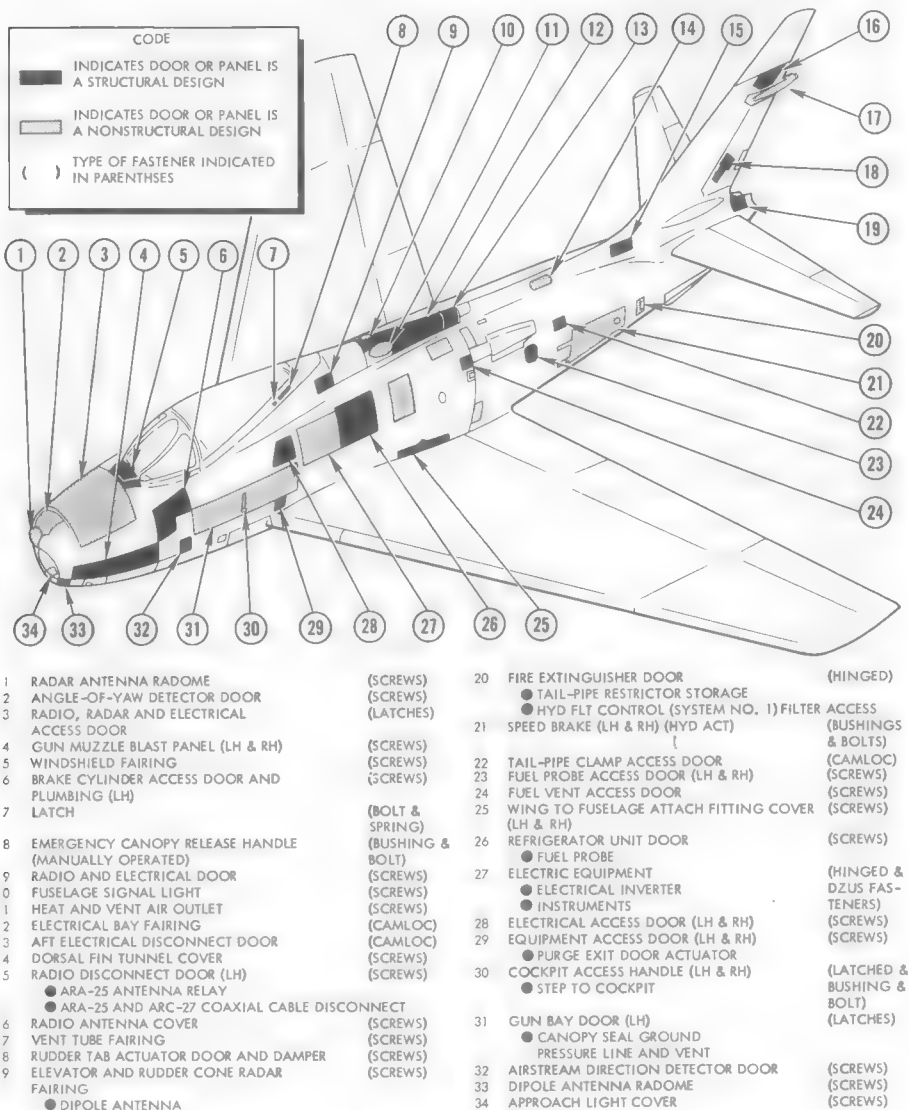


Figure No. 1-7. Access and Inspection Provisions (Sheet 2)

**Section I**  
**Access and Inspection Provisions**

NAVAER 01-60JKE-502

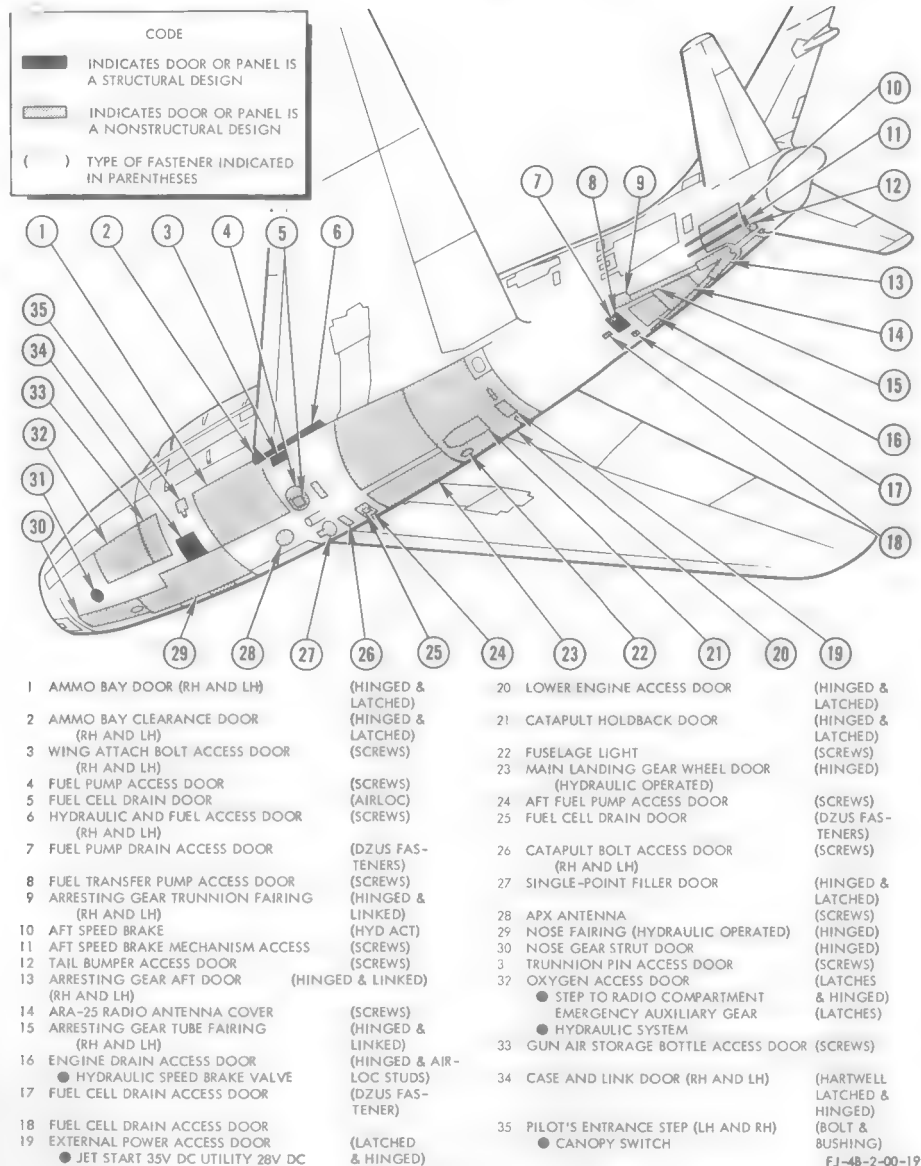
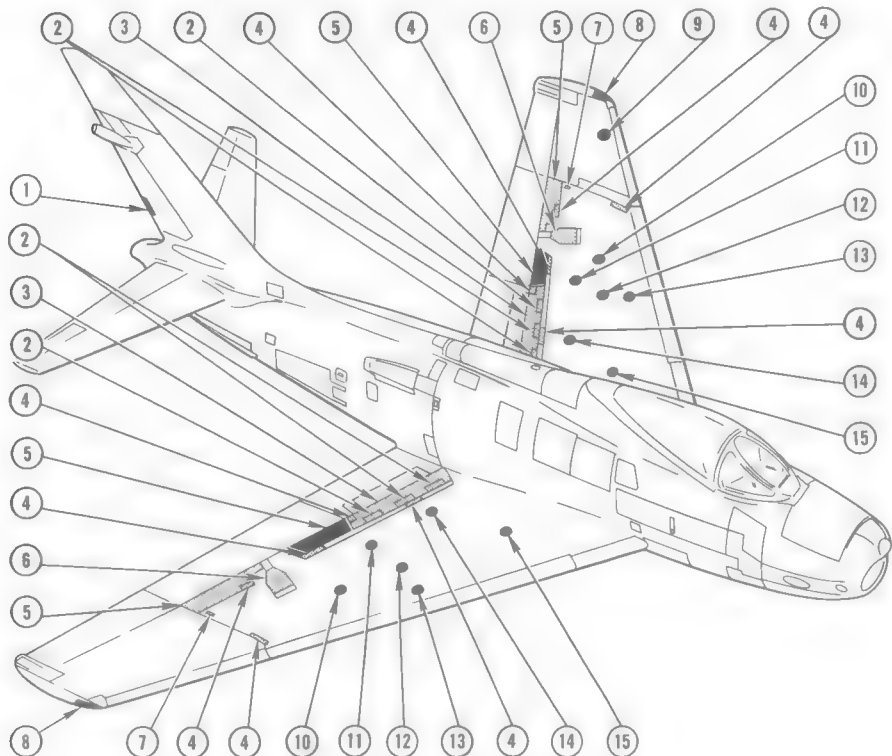


Figure No. 1-7. Access and Inspection Provisions (Sheet 3)



- 1 RUDDER TRIM TAB
- 2 FLAP ACTUATOR DOOR
- 3 CONTROLS ACCESS DOOR
- 4 PIN REMOVAL COVER
- 5 CONTROLS ACCESS DOOR
- 6 AILERON ACTUATOR DOOR
- 7 FLAG

- (HINGED)  
(SCREWS)  
(HINGED)  
(SCREWS)  
(SCREWS & HINGED)  
(HINGED & AIRLOCS)  
(TELEFLEX OPERATED)

- 8 NAVIGATION LIGHT
- 9 REMOTE COMPASS ACCESS DOOR (LH ONLY)
- 10 FUEL GAGE TANK UNIT NO. 3
- 11 FUEL GAGE TANK UNIT NO. 4
- 12 FUEL GAGE TANK UNIT NO. 5
- 13 FUEL GAGE TANK UNIT NO. 1
- 14 FUEL GAGE TANK UNIT NO. 6
- 15 FUEL GAGE TANK UNIT NO. 2

- (SCREWS)  
(SCREWS)  
(SCREWS)  
(SCREWS)  
(SCREWS)  
(SCREWS)  
(SCREWS)  
(SCREWS)

## CODE

INDICATES DOOR OR PANEL IS A STRUCTURAL DESIGN

INDICATES DOOR OR PANEL IS A NON STRUCTURAL DESIGN

( ) TYPE OF FASTENER INDICATED IN PARENTHESES

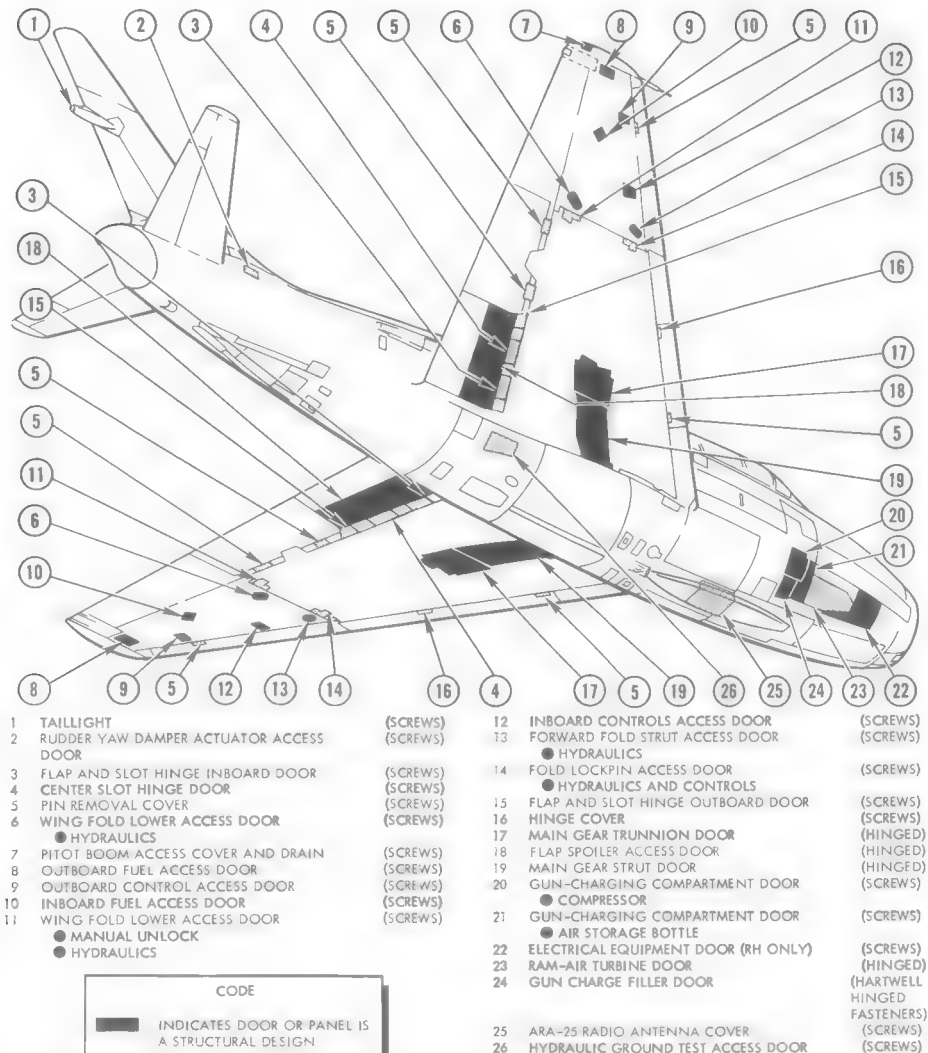
*Note* Wing surfaces typical left- and right-hand wings, except as noted.



FJ-48-2-00-20

Figure No. 1-7. Access and Inspection Provisions (Sheet 4)

Section I  
Access and Inspection Provisions

NAVAER 01-60JKE-502



| CODE  |   |
|---|---|
|  | INDICATES DOOR OR PANEL IS A STRUCTURAL DESIGN    |
|  | INDICATES DOOR OR PANEL IS A NONSTRUCTURAL DESIGN |
| ( )   | TYPE OF FASTENER INDICATED IN PARENTHESES         |

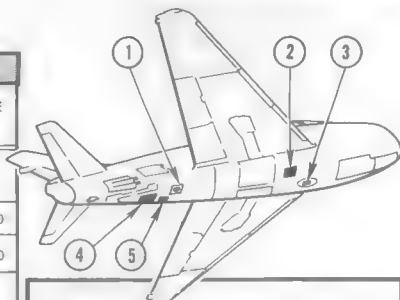
**Note** Wing surfaces typical left- and right-hand wings, except as noted.

FJ-4B-2-00-21

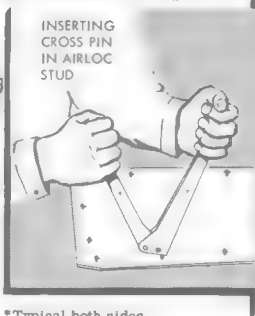
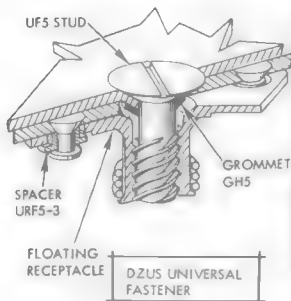
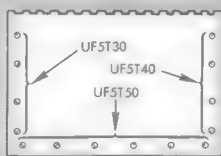
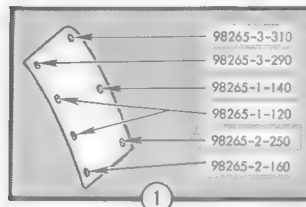
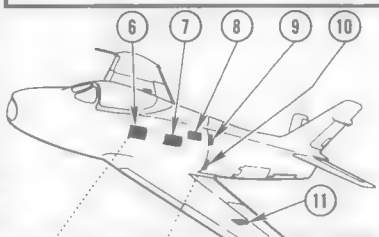
Figure No. 1-7. Access and Inspection Provisions (Sheet 5)



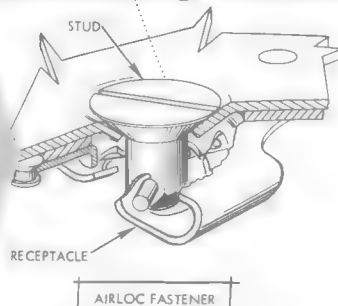
| TABLE    |               |  |  |                            |                     |
|----------|---------------|--|--|----------------------------|---------------------|
| DOOR NO. | FASTENER MFG. | STUD PART NO.  | STUD LENGTH IN INCHES                              | NO. REQD                   | RECEPTACLE PART NO. |
| 1-2-5    | DZUS          | UF5T20   | 0.710  | ONE EACH DOOR              | URF5                |
| 3        | AIRLOC        | 98265-2-190  | 0.609  | 1                          | 99947-P.130         |
| 4        | AIRLOC        | 98265-2-210  | 0.609  | 12                         | 99947-P.130         |
| 6*       | DZUS          | UF5T30<br>URST40<br>UF5T50   | 0.810<br>0.910<br>1.010                            | 4<br>4<br>6                | URF5                |
| 7*       | DZUS          | UF5T20   | 0.710  | 9                          | URF5                |
| 8*       | DZUS          | UF5T20   | 0.710  | 5                          | URF5                |
| 9*       | AIRLOC        | 98265-3-290<br>98265-2-160<br>98265-1-120<br>98265-3-310<br>98265-1-140<br>98265-2-250 | 0.719<br>0.609<br>0.500<br>0.719<br>0.500<br>0.609 | 1<br>1<br>2<br>1<br>1<br>1 | 99833-P.130         |
| 10*      | AIRLOC        | 98265-1-150<br>98265-2-170   | 0.500<br>0.609                                     | 3<br>3                     | 99833-P.130         |
| 11*      | AIRLOC        | 98265-3-290  | 0.719  | 18                         | 99947-P.130         |



**Note** Quick fasteners such as dzus, Airloc's and Camloc's (4002) are in locked position when slot in stud is aligned with painted black stripe on mating surface.



\*Typical both sides



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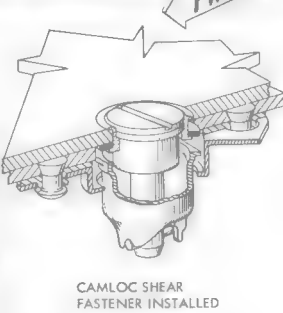
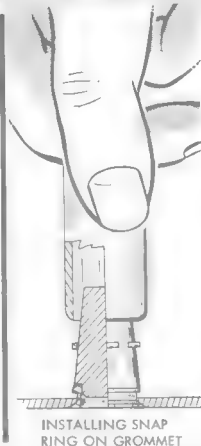
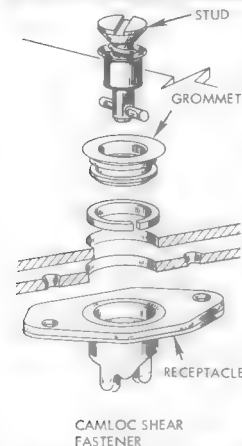
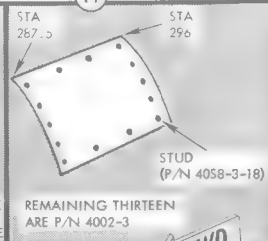
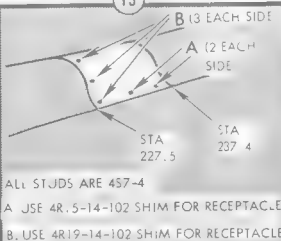
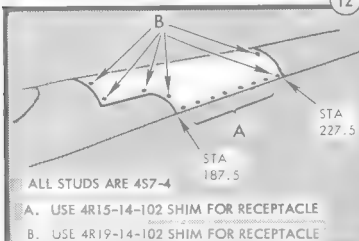
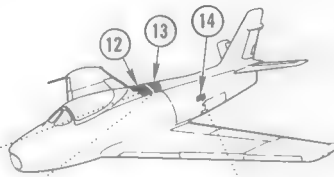
Figure No. 1-8. Access Door Fasteners (Sheet 1)

**Section I**  
**Access and Inspection Provisions**

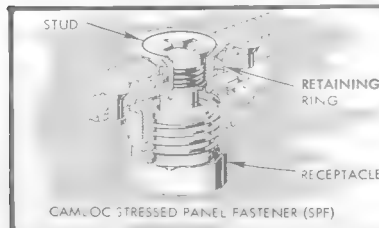
NAVAER 01-60JKE-502

**TABLE**

| DOOR NO. | FASTENER MFG | STUD PART NO.       | NO. REQD | RECEPTACLE PART NO. |
|----------|--------------|---------------------|----------|---------------------|
| 12       | CAMLOC       | 457-4               | 13       | 4R1-14              |
| 13       | CAMLOC       | 457-4               | 10       | 4R1-14              |
| 14       | CAMLOC       | 4002-3<br>4058-3-18 | 13<br>1  | 214-16              |



**Note** For adjustment of access doors fastened with latches, refer to paragraph 2-8.



**OPERATION OF CAMLOC (SPF) FASTENERS**

**To Unfasten:**

- Turn left at least one-half turn.

**To Fasten:**

- Push stud in and turn right until tight. Torque stud to approximately 40 inch-pounds.
- If stud pops out, push in, turn left one-half to one full turn; then, still pushing in, turn right until tight.

**Caution** Do not use a power driver on these fasteners.

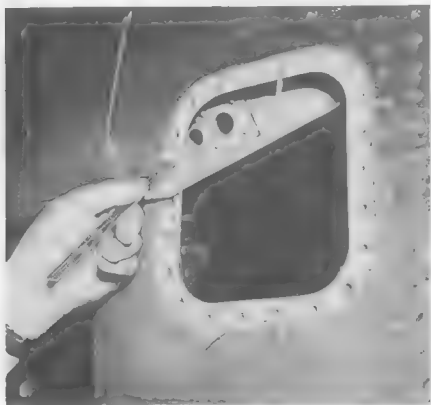
**Note** Use No. 2 Phillips screwdriver on Camloc (SPF) fasteners.

FJ-48-2-00-23A

**Figure No. 1-8. Access Door Fasteners (Sheet 2)**

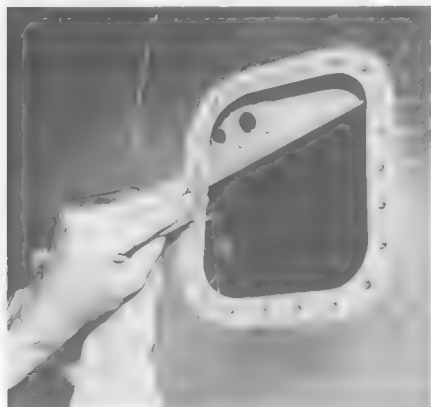
## CLEANING

- 1 Remove old sealant from surface to which compound is to be applied by use of a wooden or metal spatula. A knife blade will prove satisfactory if care is taken not to scratch the metal.



- 2 If the area is primed, check primer adhesion by scratching the surface with the thumbnail. Primer may be left on the surface if its adhesion is good, but if unsatisfactory, remove old primer with a stiff bristle brush and methyl-ethyl-ketone (item 90, materials list) and re-prime.

- 3 Using a clean cloth moistened with solvent (item 119, materials list), clean the surface receiving the sealing compound and that area of the door or panel mating with this surface and wipe dry with a clean cloth.



**Note** It is very important that the area to which the sealant is applied be perfectly clean to ensure good adhesion of the sealant.

MIXING AND HANDLING SEALING  
COMPOUND

- 1 The required sealing material is prepared for use by combining and mixing all of the base compound (item 112, materials list) with all of the accelerator (item 112, materials list). This sealing compound is available in one pint and one quart kits. An alternate sealing compound (item 110, materials list) may be used if the aforementioned sealant is not available.
- 2 The combined materials should be mixed for a period of 5 to 15 minutes or until no particles of the accelerator are evident in the base compound.
- 3 At room temperature (approximately 77° F), the sealing compound should be used as soon as possible (not more than 3 hours) after being mixed or after removal from storage.

**Note** After being mixed the sealing compound may be stored at 0° to -10°F for a period of 3 days (72 hours). Discard after this period of time.

- 4 Clean-up of workers hands will be facilitated by use of "Pro-Tek" hand cream on the hands prior to handling sealant.

## APPLICATION OF SEALANT

- 1 Apply a 1/4-inch diameter bead of sealant to the cleaned surface.
- 2 Spread out bead with a clean wooden spatula as shown.

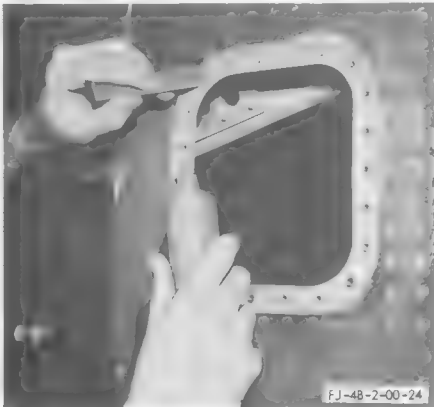
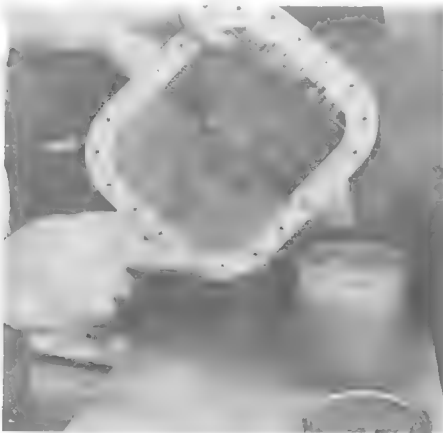


Figure No. 1-9. Access Door Weather Sealing (Sheet 1)

- 3** Apply a thin film of petrolatum (item 100, materials list) to mating door or panel to prevent sealing compound from adhering to this surface.

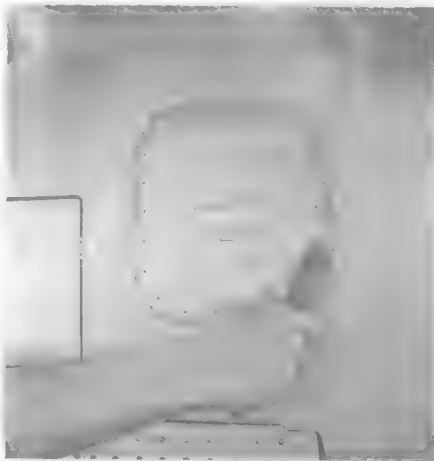
**Caution** Use only enough petrolatum to cover the surface with a thin film. When securing the door or panel, an excessive amount of petrolatum could be forced under the sealing compound resulting in loss of its adhesive qualities.



- 4** Secure door or panel and allow to remain in that position until sealant is completely cured (approximately 8 hours at room temperature).



- 5** After sealant has cured, trim off excess sealing compound with a sharp knife. Be careful not to damage painted areas.



- 6** Wipe petrolatum from door or panel with a clean dry cloth.



**Caution** To prevent water leakage into airplane, care should be taken by personnel to avoid damaging seals during routine maintenance.

FJ-48-2-00-25

Figure No. 1-9. Access Door Weather Sealing (Sheet 2)

**GROUND HANDLING****1-7. GROUND HANDLING.**

1-8. During various ground handling operations and procedures, the following precautions must be observed to prevent damage to the airplane and, especially, to prevent injury to personnel performing the ground handling operations.

**WARNING**

- The emergency escape system, which incorporates canopy jettisoning and seat ejection, must be thoroughly understood by anyone who has occasion to enter the cockpit. This system can be a potential death trap to personnel not familiar with its operation. Look for the safety pins before entering the cockpit area. (See figure 1-10.)
- During ground run-up of the engine, both ends of the airplane are lethal. The in-rushing air at the nose can pull a man into the air duct and kill him. The exhaust at the tail of the airplane forms a mankilling torch. (See figure 1-11.)

**WARNING**

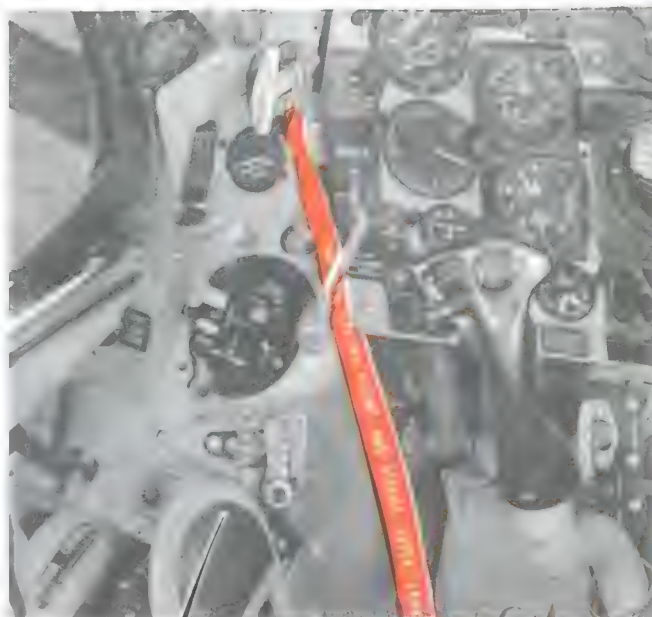
- Do not lift or push on movable surfaces when handling the airplane. Control surfaces, speed brakes and hydraulically operated units can cause serious damage to personnel. Do not actuate the control stick or other system controls unless personnel and equipment are clear. (See figure 1-13.)
- Landing gear wheel wells are danger points unless ground safety locks and pins are installed. Look for the safety locks and pins before working in this area. (See figure 1-14.)
- In the event of a crash landing, rescue of the pilot is of primary importance although extreme caution should be used in the rescue operation. For emergency entrance procedure, see figure 1-12.

**Note**

When maintenance is completed and the airplane is ready for flight operations, cockpit equipment must be properly stowed to simplify cockpit entry, expedite take-off and reduce the need for assistance by the plane captain. Proper stowage of cockpit equipment is shown in figure 1-15.

# *Warning*

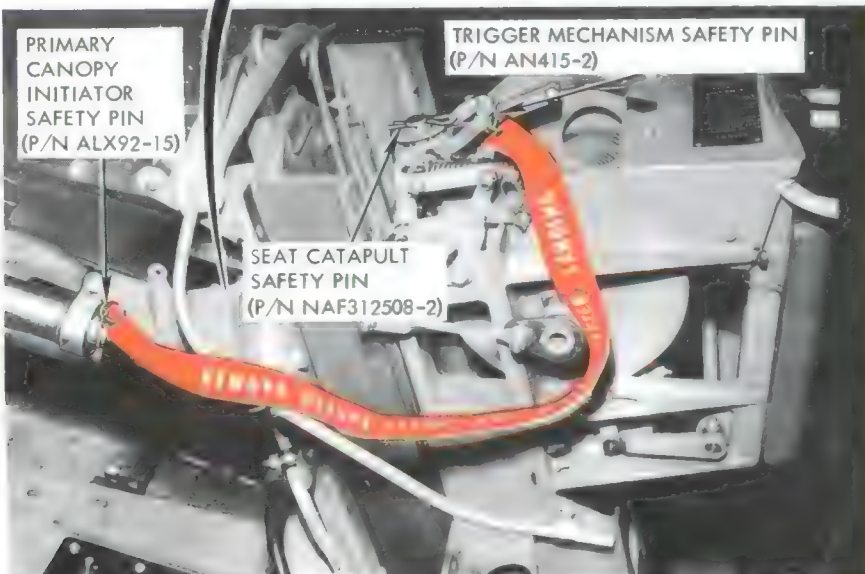
- Keep out of the cockpit unless maintenance is required.
- Always consider the emergency escape system loaded and armed.
- Know where the safety pins are and be certain of their installation.
- Do not manipulate linkage without full knowledge of the emergency escape system.
- Do not use linkage or handles as handgrips.
- The catapult cartridge, canopy remover, remover initiators and exactor are ordnance items and should be checked and maintained only by qualified personnel.



PRIMARY CANOPY  
INITIATOR SAFETY  
PIN  
(P/N ALX92-15)



CANOPY  
EMERGENCY  
RELEASE  
HANDLE  
SAFETY PIN  
(P/N ALX92-15)



PRIMARY  
CANOPY  
INITIATOR  
SAFETY PIN  
(P/N ALX92-15)

TRIGGER MECHANISM SAFETY PIN  
(P/N AN415-2)

SEAT CATAPULT  
SAFETY PIN  
(P/N NAF312508-2)

TRIGGER MECHANISM  
SAFETY ON

FJ-48-2-55-2

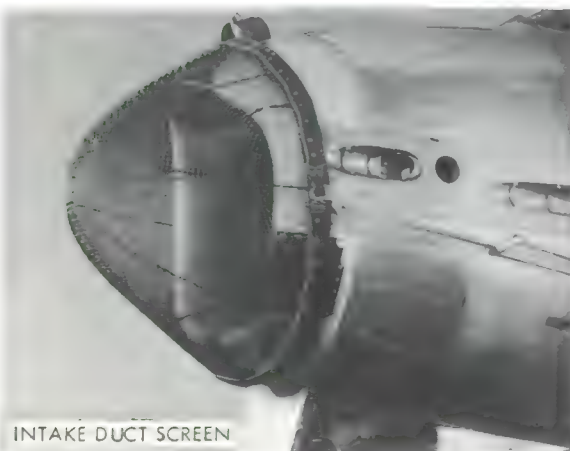
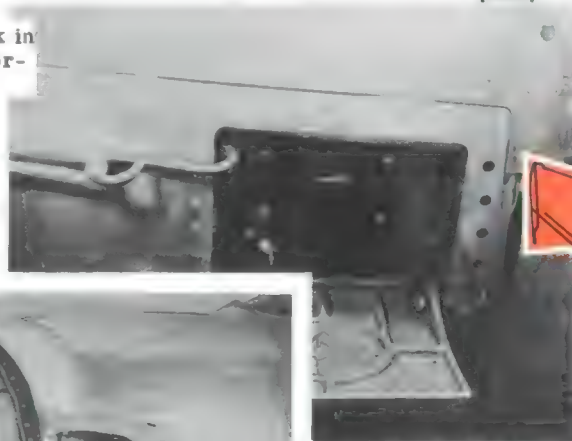
Figure No. 1-10. Emergency Escape System Ground Safety Pins



*Warning*

- Do not stand near the front of the air inlet duct while the engine is operating.
- Always approach the airplane from the side but not in the plane of rotation of the turbine when the engine is running.
- Avoid wearing hats or other loose clothing when working in the run-up area.
- Do not carry loose articles such as pencils, key rings or tools when near the air inlet duct.
- Do not foolishly experiment with the margin of safety by standing near, or feeling with your hand, the suction created by the engine.
- Do not stand on wing of the airplane while engine is operating, unless assistance is required during cockpit check-out or functional check of equipment.
- The loudest sustained noise produced by man is the noise of a jet engine operating at high rpm. Jet-engine noise is dangerous to personnel working in the immediate area. At distances from 50 to 200 feet, wear ear plugs and at distances within a radius of 50 feet, wear ear plugs and a type of over-the-ear protector. Prolonged exposure to jet-engine noise can cause pain and damage to the inner ear. Other effects of prolonged exposure are fatigue, nervousness and impairment of hearing.
- Do not stand at the edge of the blast area as the temperature could suddenly increase with engine speeds.

Place retaining rope hook in existing hole located in forward frame of step.



INTAKE DUCT SCREEN

ATTACH POINT AT STEP

**Caution** The area in front of the air inlet duct should be swept clean to minimize the possibility of dirt or other objects being drawn into the compressor and damaging the engine.

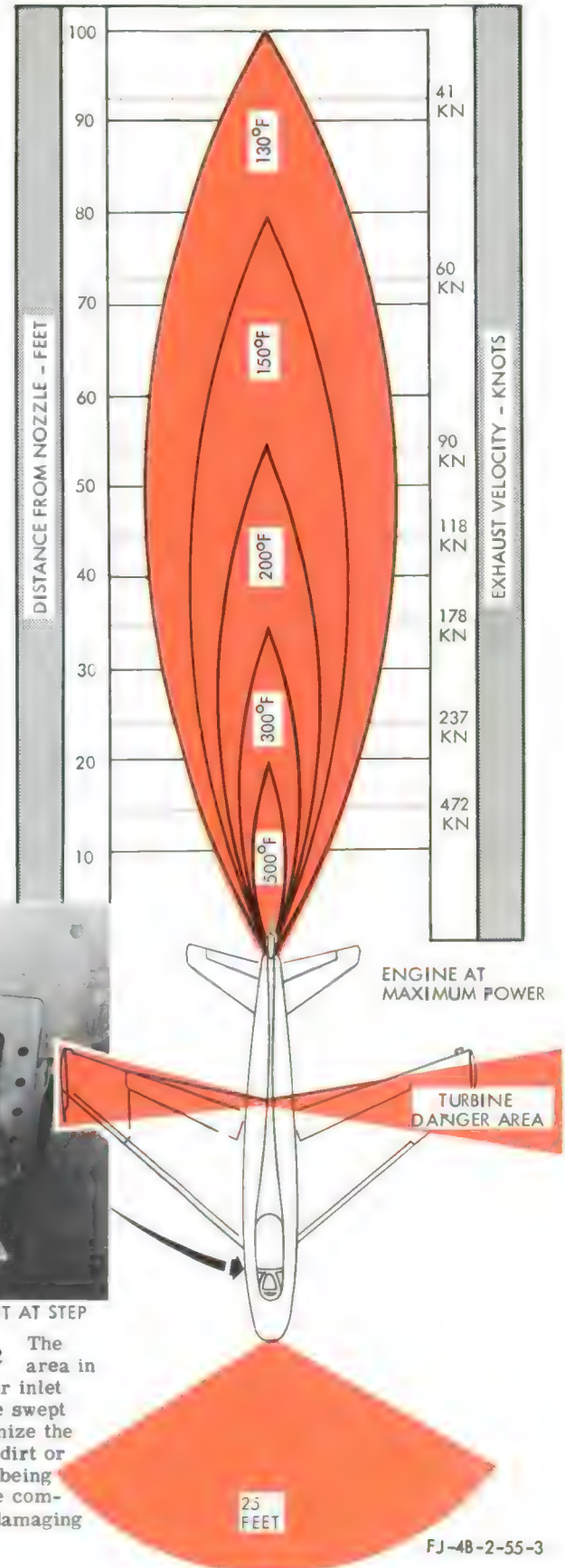


Figure No. 1-11. Ground Run-up Danger Areas

## Section I Ground Handling

NAVAER 01-60JKE-502

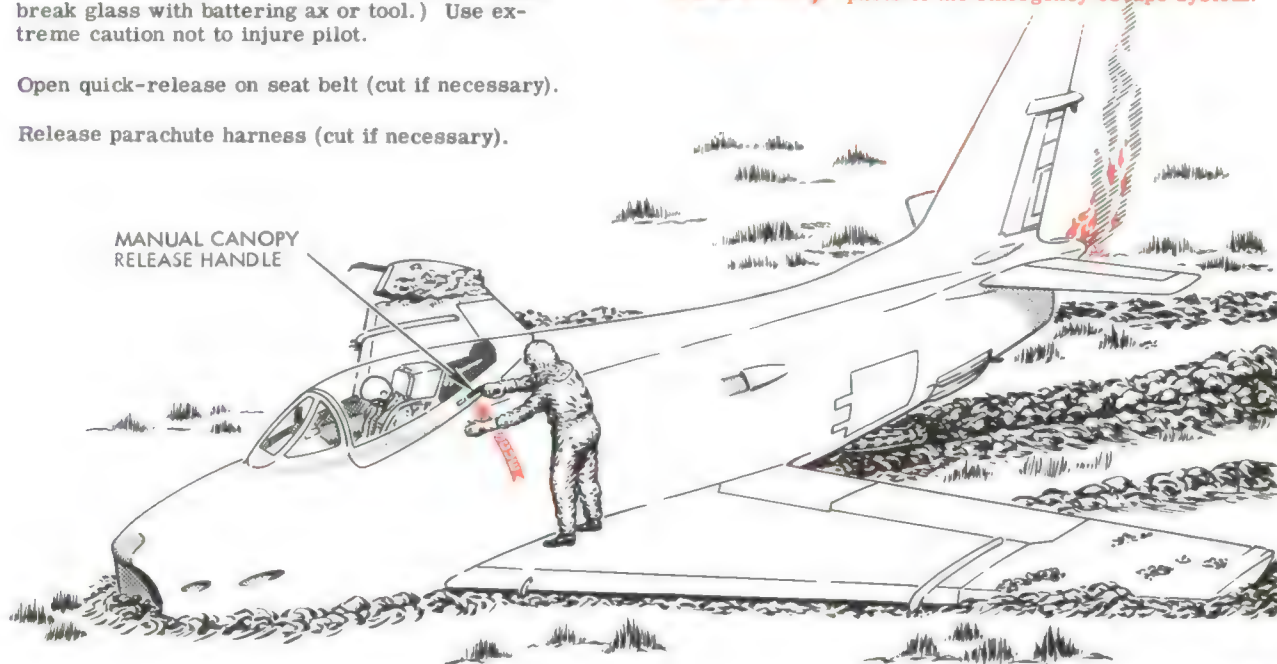
To remove the pilot after a crash landing, proceed as follows.

- A. Remove canopy by using manual canopy release handle located on left-hand side of canopy frame above "RESCUE" marking. (If canopy is jammed, break glass with battering ax or tool.) Use extreme caution not to injure pilot.
- B. Open quick-release on seat belt (cut if necessary).
- C. Release parachute harness (cut if necessary).

D. Disconnect oxygen and radio cord, etc.

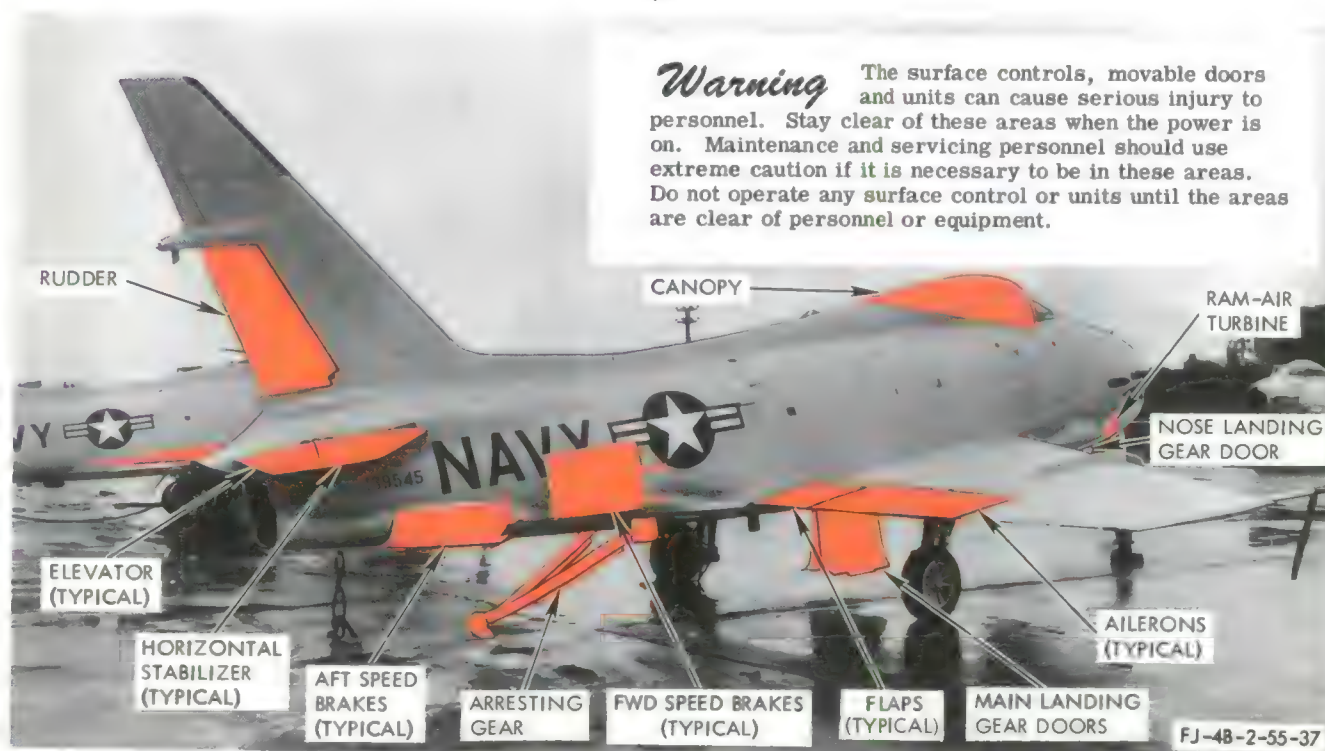
E. Carefully remove pilot.

**Warning** Do not attempt to force removal of any parts of the emergency escape system.



FJ-4B-2-55-36

Figure No. 1-12. Emergency Cockpit Entrance



FJ-4B-2-55-37

Figure No. 1-13. Movable Surface Hazards



**Warning** Ground safety locks and pins are to be installed at all times, except for flight and gear retraction check. Remove immediately before flight and stow in cockpit map case.

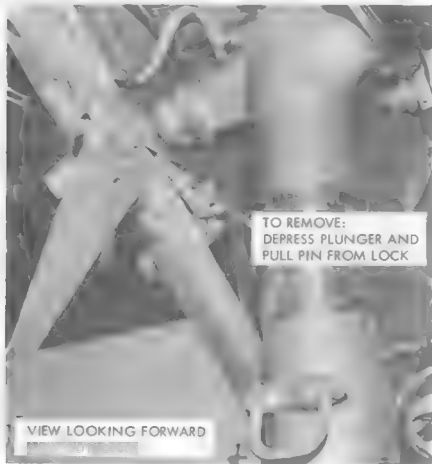
A time-saving method for performing certain testing procedures on the airplane (which normally would require the use of ground jacks) may be accomplished by disabling the ground safety switch. Attach a red warning flag, similar to the flags used on the landing gear ground safety locks, whenever the ground safety switch is disabled.

**Warning** When a red warning flag has been attached to the ground safety switch to indicate a disabled switch, never remove flag from the unit until switch has been properly connected.

## GROUND SAFETY SWITCH



## NOSE LANDING GEAR GROUND SAFETY LOCK



## MAIN LANDING GEAR GROUND SAFETY LOCK



**Note** There is no ground safety lock for the arresting gear.

Figure No. 1-14. External Ground Safety Locks and Pins

A webbing strip is provided for securing the oxygen hose to the underside of the instrument panel shroud.

*Note* The radio cord is an integral part of this hose.

#### A REMINDER TO PLANE CAPTAINS

Keeping cockpit loose equipment properly secured is a definite must in operational aircraft. These are the reasons why:

- Saves time.
- Simplifies pilot's entry into the cockpit.
- Eliminates misplacement of straps.
- Expedites scramble take-off.
- Reduces need for plane captain's assistance during pilot entry into cockpit.

Clips are provided on both sides of the ejection seat back for securing the ends of the shoulder-harness and lap belt.

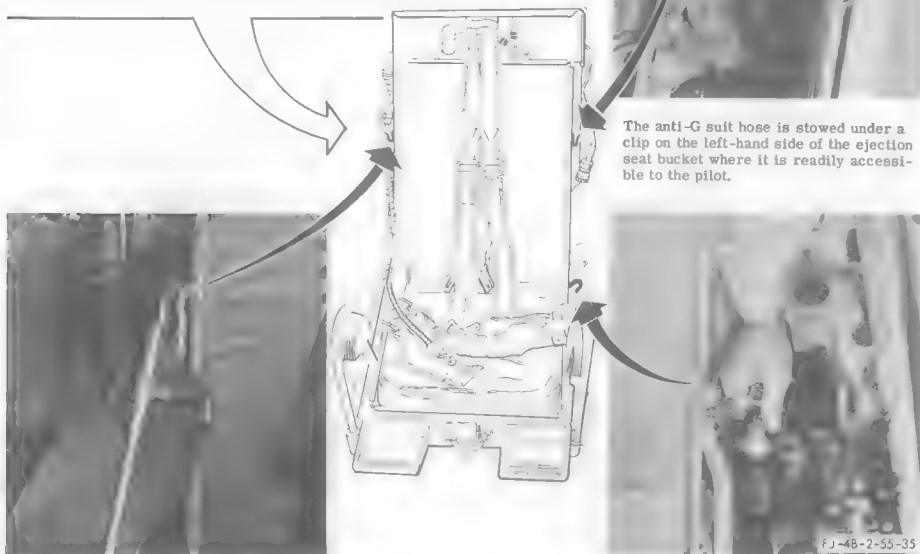


Figure No. 1-15. Stowage of Cockpit Equipment

## 1-9. ENGINE GROUND OPERATION.

**PRESTART CHECK**

Before entering airplane, make the following exterior checks:

- 1** See that airplane is properly serviced. (Refer to paragraph 1-33 for proper servicing procedures for all systems.)
- 2** Remove any mooring lines that might be attached and position airplane so that it is headed either into the wind or at a 45-degree angle with it. A tail wind may increase exhaust temperatures and cause an engine fire during starting.
- 3** Make sure the wheels are firmly chocked.
- 4** Check the exterior of the airplane and the tail-pipe area for any visible signs of fuel, oil or hydraulic fluid leakage. If leakage is discovered, wipe up with a clean cloth. Determine source of leakage and repair if necessary.
- 5** See that all access doors, panels and fairings are properly installed and securely fastened.
- 6** Remove the air inlet duct plug, tail-pipe cover, engine compartment cooling duct plugs and any other protective covers that may be installed.

- 7** Check the air intake duct for loose screws, rivets or foreign material and ensure that the starter-generator cover is properly secured.

**Warning** When making this check, be absolutely certain that all personnel concerned have been warned not to attempt an engine start.

- 8** Install the air inlet duct screen.

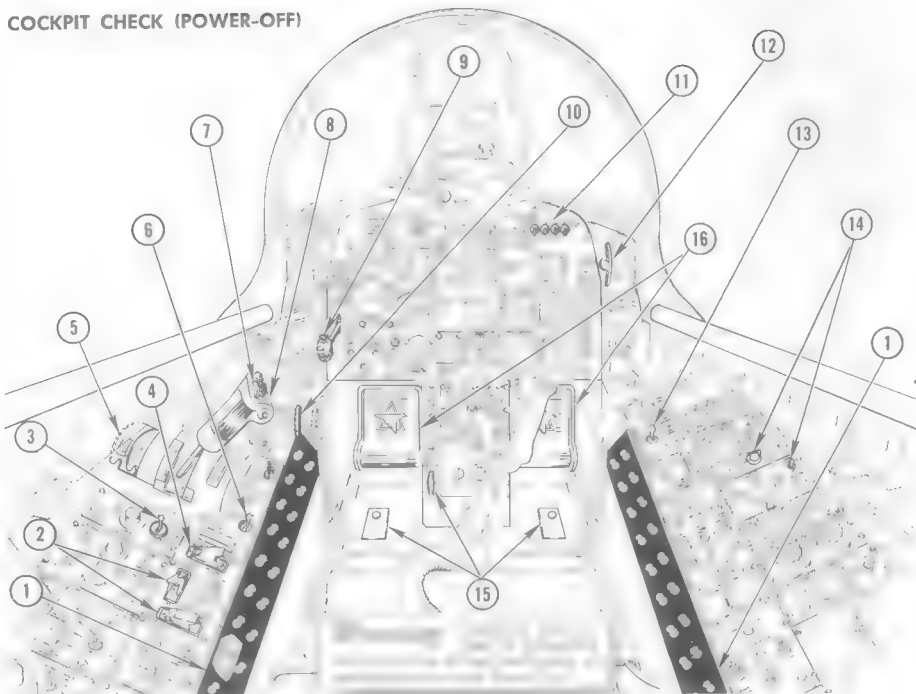
- 9** Prepare the airplane for engine run-up by providing suitable fire fighting equipment and an external power unit.

- 10** During engine operation, be sure the danger areas around the air inlet duct and exhaust tail pipe are clear and will remain clear of other aircraft, vehicles, personnel, equipment and debris.

**Note** The duties of the crew members assigned to assist with engine run-up are manifold. They must be qualified to the extent that they are thoroughly familiar with fire extinguishing equipment, the operation of external power units, and above average capabilities in detecting any sounds or signs of engine malfunction. Additional duties include checking for wheel chock slippage and warning oncoming traffic of the danger areas. There should exist an understanding of hand signals between the standby personnel and the person running up the engine.



COCKPIT CHECK (POWER-OFF)



Make the following cockpit checks:

- |   |   |
|---|---|
| <b>1</b> All circuit breakers for proper position.            | <b>9</b> Landing gear control handle "DOWN."                                  |
| <b>2</b> ENGINE MASTER and EMERGENCY IGNITION switches "OFF." | <b>10</b> Drop tank emergency release and ram-air turbine release handles in. |
| <b>3</b> Radar power switch "OFF."                            | <b>11</b> Armament master switches "OFF."                                     |
| <b>4</b> MANUAL FUEL CONT switch "PRIMARY."                   | <b>12</b> Landing gear emergency release handle in.                           |
| <b>5</b> Wing flap switch "UP."                               | <b>13</b> D-C power switch "OFF."   |
| <b>6</b> LDG LIGHT switch "OFF."                              | <b>14</b> Communication and navigation equipment switches "OFF."              |
| <b>7</b> SPEED BRAKE switch neutral.                          | <b>15</b> Release rudder locks and adjust rudder pedals.                      |
| <b>8</b> POWER CONTROL lever "OFF."                           | <b>16</b> Depress brake pedals to check that brakes are not spongy.           |

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## POWER-ON COCKPIT CHECK

With the external power unit operating, make the following checks:

- 1** Test fire warning system by pushing fire detector button.
- 2** Push fuel gage check button and check for counter-clockwise rotation of pointer. (This rotation indicates electrical power is being supplied to instrument.)

- 3** Check fuel quantity.

- 4** Test all warning lights and indicators by pushing warning light test switch.

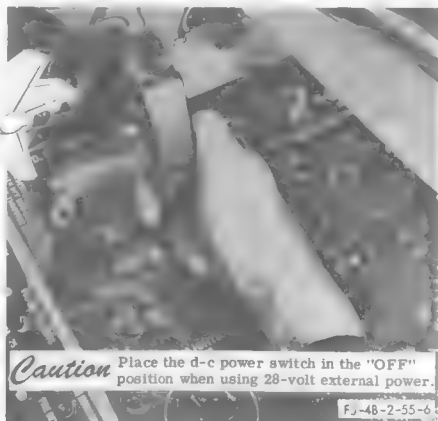
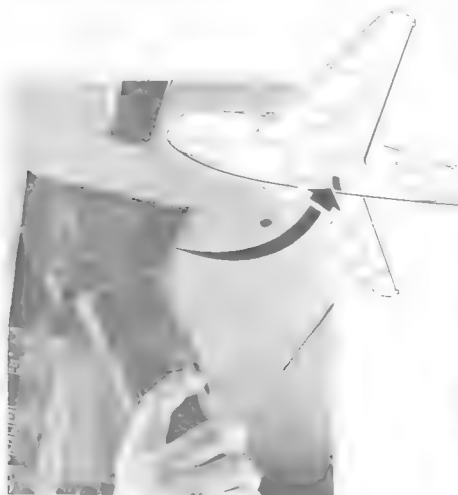
- 5** INST. AC POWER switch on "NO. 1 INV."

## NORMAL STARTING

When starting the engine, electrical power is applied to both external power receptacles. The power source for jet starting should be a 1000 (+100/-0) ampere, constant-current, 35-volt d-c type power unit equipped with one plug to mate with the jet starting (rectangular-shaped) receptacle. The servicing power source should be a 28-volt d-c constant-voltage type power unit with a minimum capacity of 500 amperes. Electrical power from this unit is plugged into the other (oval-shaped) receptacle for electrical requirements other than starting.

## EMERGENCY STARTING

When the normal jet starting power source (1000-ampere, constant-current, 35-volt d-c power unit) is not available, a 28-volt d-c constant-voltage power unit having a minimum capacity of 1000 (+100/-0) amperes may be used in an emergency only. The servicing power source (500-ampere 28-volt d-c constant-voltage power unit) is required for normal starting or emergency starts. These units are equipped with standard plugs and care must be exercised to plug the 1000-ampere power source into the jet starting (rectangular-shaped) receptacle.



STARTING

- 1** Place the power control lever in the "OFF" position.



- 2** Position the d-c power switch to "BAT. & GEN."

- 3** Turn ENGINE MASTER switch "ON."



**Warning** Do not move the aircraft control stick until the engine speed stabilizes at idle rpm. Movement of the control stick results in hydraulic pressure being directed to the control surface actuating cylinders which consequently imposes additional and undesirable loads on the engine during the starting cycle.

- 4** Move the engine STARTER switch to "START" momentarily.



*Caution*

- If there is no audible indication of engine rotation, or if the tachometer fails to register within a few seconds, place the STARTER switch in the "STOP" position. The high current required for starting will burn out the starter in a few seconds if the engine does not begin to turn as soon as the starter is energized.
- If the engine speed does not reach 11 percent rpm within 30 seconds after actuating the starter switch, position the switch to "STOP" and investigate the reason for the slow starter acceleration.
- Allow five minutes for surplus fuel to drain before attempting another start.

- 5** When 11 percent rpm is indicated, move the power control lever to the "IDLE" position. (This action supplies ignition and fuel to the engine.) A normal start with the power control lever in the "IDLE" position is recommended. However, if maximum temperature is anticipated or obtained, proceed as follows:



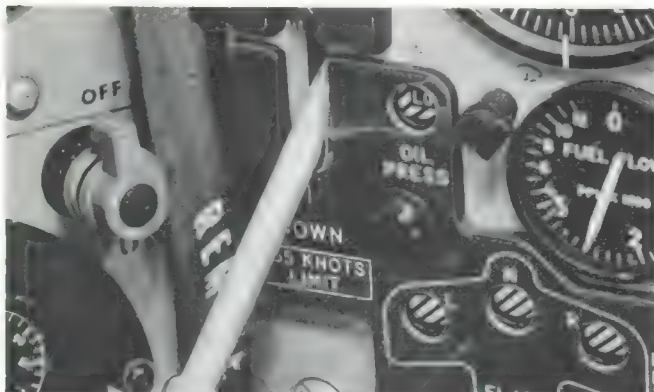
- A. Retard the power control lever as necessary toward the "OFF" position to reduce the fuel flow while monitoring the exhaust gas temperature.

**Note** It is possible to meter the fuel flow only from "IDLE" to the "OFF" position. In the event of an rpm hang-up, it is not possible to increase fuel flow by advancing the power control lever above the idle range.

- B. After the exhaust gas temperature has dropped below the maximum limit, carefully advance the power control lever to "IDLE", monitoring the exhaust gas temperature to keep from exceeding the limit.

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- 6** Check that oil pressure indicator reads low (LO) or normal (N).



**Caution** If engine fails to start after two starting attempts. Starter and ignition system must be allowed to cool for a minimum of 30 minutes. If engine fails to start on next attempt after the 30-minute cooling period. Starter and ignition system must be allowed to cool for an additional 30 minutes before another start is attempted.

**Warning** If exhaust gas temperature does not rise within approximately fifteen seconds after moving the power control lever to "IDLE" position, retard the power control lever to the "OFF" position, place the STARTER switch at "STOP" and allow the engine to stop.

### Note

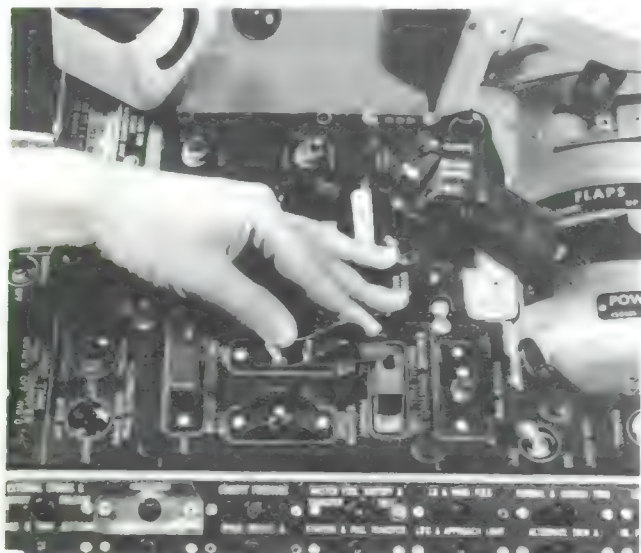
- If engine does not reach idle rpm in two minutes or less, discontinue start and determine cause for slow start.
- Log the duration and peak temperature on each start where the exhaust gas temperature exceeds 800°C.
- If the exhaust gas temperature reaches or exceeds the hot start limit of 900°C, the engine shall be immediately stopped and must then be subjected to an over-temperature inspection.
- If the exhaust gas temperature exceeds 800°C five times, the engine must be subjected to an over-temperature inspection.
- For performing engine idle speed check, 85% rpm check, 100% rpm check, acceleration test, fire detection system check, oil consumption check and engine controls adjustments, refer to Section V.

## ENGINE SHUTDOWN

- 1** Run the engine at idle rpm for one minute to allow the exhaust gas temperature to stabilize.
- 2** Place the power control lever in "OFF" position.

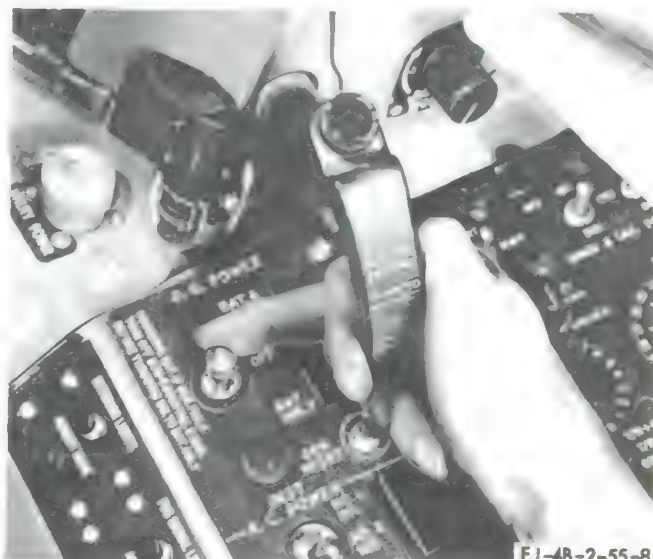
**Caution** Wait until engine rpm has reached zero before placing master switch and d-c power switch to "OFF." If this sequence is not followed, it is possible to collapse the fuel line.

- 3** When engine rpm has reached zero, move ENGINE MASTER switch to "OFF" position.



### Warning

- Remain clear of the exhaust area during the engine cooling period. A warm engine, at times, will belch hot gases even though all the switches are off. Although jet exhaust gas is not particularly toxic, it has a disagreeable odor and its strong fumes will cause eye smarting.
- Do not move airplane indoors until the engine has cooled.
- 4** Move d-c power switch to "OFF" position.



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## 1-10. EXTINGUISHING GROUND FIRES.

### FIRE FIGHTING PRECAUTIONS

If necessary precautions are not taken while fighting a fire, serious injury may result to personnel. Listed here are several precautions to take.

- 1** Fight fire, when possible, from up-wind side.
- 2** Do not stand in flammable liquids.
- 3** Do not put yourself in a position where you could be trapped by fire or fumes.
- 4** Be careful not to slip on wet surfaces.
- 5** Do not use foamite to extinguish an engine fire except in an emergency.

### Note

- No fire extinguishing system is provided in the airplane.
- The fire access doors should be open during all starts and ground running.
- The preferable fire extinguishing agent is either dry chemical powder or chlorobromomethane; carbon tetrachloride may be used in an emergency.
- The use of CO<sub>2</sub> is undesirable because if the cold CO<sub>2</sub> were allowed to come in contact with the engine hot section, damage to the engine may result.

### COMPRESSOR COMPARTMENT FIRE

- 1** Place the power control lever in the "OFF" position.
- 2** Turn the ENGINE MASTER switch to the "OFF" position and the d-c power switch to the "OFF" position; then leave the cockpit.
- 3** Direct dry chemical extinguishing agent through any open access door or through any cooling air opening.



### IN CASE OF FIRE. CALL

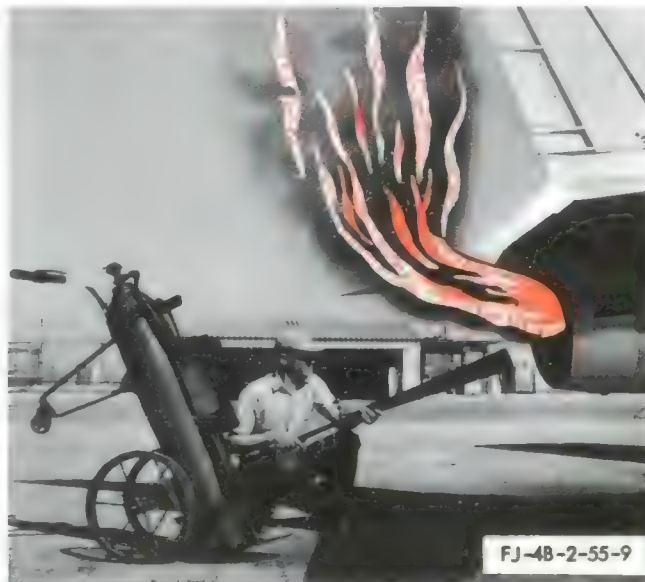


**Caution** Don't make the mistake of assuming fire extinguishing equipment is serviceable. Check to make sure it is serviced and ready for use.

### TAIL-PIPE FIRE

(AFTER FIRES AND WET STARTS)

- 1** Place the power control lever in the "OFF" position.
- 2** Leave the d-c power switch in the "BAT. ONLY" or "BAT. & GEN" position and the ENGINE MASTER switch in the "MASTER" position to ensure power to the starter system.
- 3** Move the STARTER switch to the "START" position. When 12% rpm is obtained, move the STARTER switch to "STOP."
- 4** If the fire is not extinguished by starter operation, direct dry chemical powder into the tail pipe.





- 5** If the fire is not extinguished by the above methods, direct the stream of extinguishing agent into the inlet duct.



AFT FUSELAGE FIRE (BETWEEN THE TAIL PIPE AND AIRPLANE SKIN)

- 1** Place the power control lever in the "OFF" position.
- 2** Turn the d-c power switch and engine master switch to the "OFF" position; then leave the cockpit as soon as possible.
- 3** The extinguishing agent should be inserted through the left-hand fire door or through either the left-hand or right-hand compartment cooling air inlet duct.



#### POSTFIRE PROCEDURES

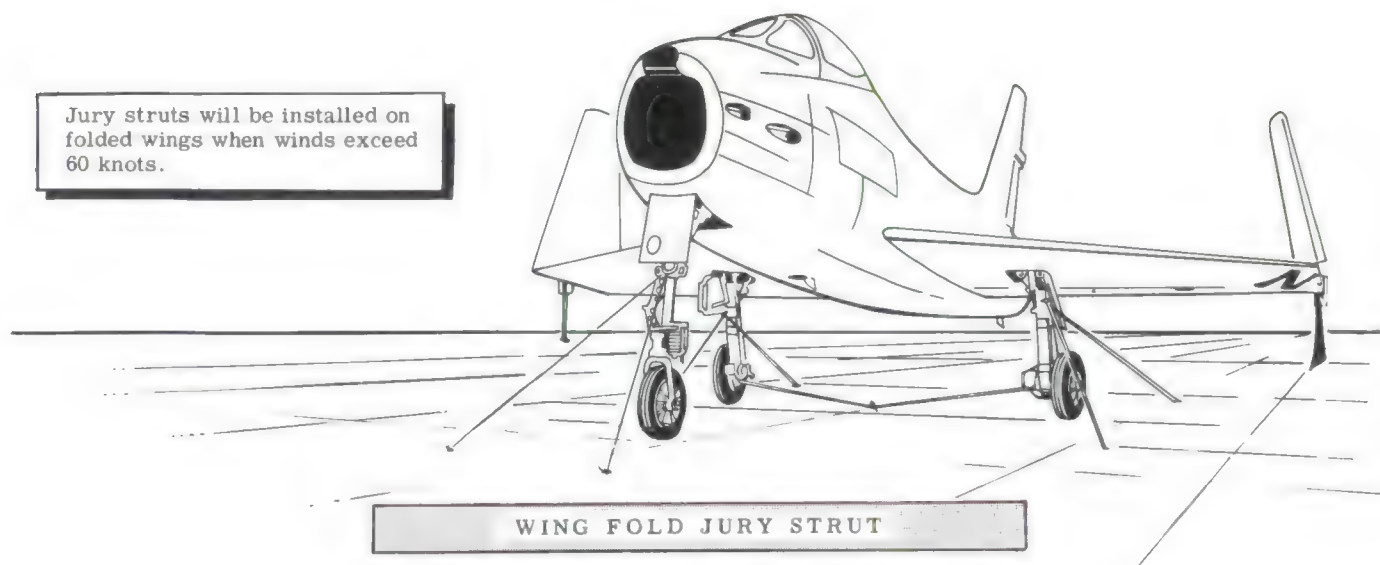
**Note** This section applies only if a dry chemical agent was used in fighting the fire. The dry chemical is corrosive and must be removed from the aircraft and engine after the fire is extinguished.

- 1** Blow off the excess dry chemical agent with compressed air or wipe the affected surfaces with a cloth.
- 2** Direct a stream of high pressure water on all areas that were subjected to residue, using large quantities. Force water between riveted components in order to remove all traces of agent.
- 3** Treat all affected areas of bare aluminum with a 5% chromic acid solution; rinse with clear water and dry with clean rags and compressed air.
- 4** Dry the structure with compressed air.
- 5** If any of the dry extinguishing agent has penetrated into the engine or into any of the accessories, the affected units must be thoroughly cleaned. If the engine is penetrated by a large quantity of the agent, it may require a complete overhaul.
- 6** Comply with the instructions in Section I of the Handbook of Structural Repair (NAVAER 01-60JKD-503) for repair of damage caused by fire or exposure to elevated temperatures.

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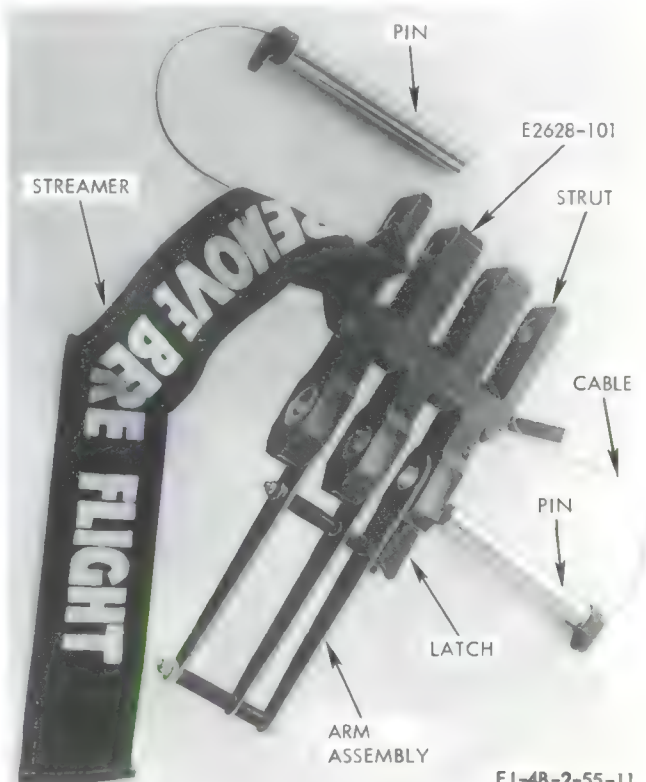
1-11. FOLDING AND SPREADING WINGS.

Jury struts will be installed on folded wings when winds exceed 60 knots.



**Note** When the jury strut is properly installed, the arm assembly should be in a horizontal position. To insert locking pins, the handle should require a slight pressure to move it to the locked position.

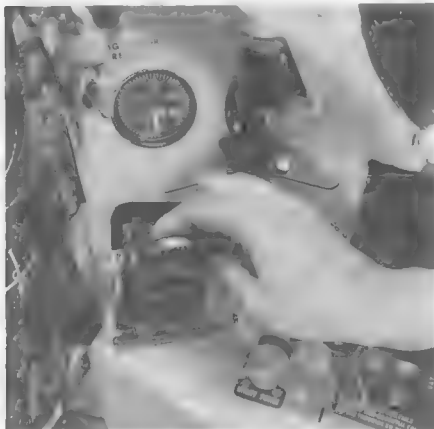
- 1** Unlock arm assembly.
- 2** Position jury strut and insert upper pin.
- 3** Insert lower pin.
- 4** Lower arm assembly until it is latched.



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## FOLDING WINGS

- 1 With landing gear control handle in "DOWN" position, actuate the wing fold lock handle to the unlocked position. This unlocks the lockpins, raises the warning flags and centers the ailerons.



**Note** Time of operation, from the selection of wing fold until complete fold of the wings, should be nine to eleven seconds.

- 2 Move the wing fold selector switch to "FOLD." This energizes the fold solenoid in the selector valve and starts the fold hydraulic cycle.



**Note** If the airplane is on jacks, the GROUND SAFETY circuit breaker located on the left-hand radio bay circuit-breaker panel must be pulled out before the wings can be folded or spread.

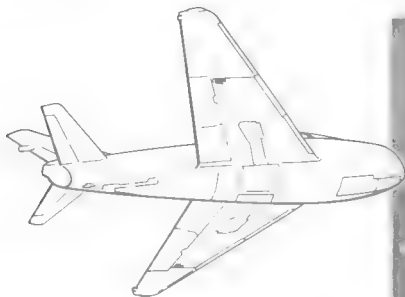
## SPREADING WINGS

- 1 To spread wings, move the wing fold selector switch to "SPREAD."



- 2 When wings are spread, move wing fold handle to locked position. This action secures the lockpins, lowers the warning flags and releases the aileron centering mechanism.

**Note** Time of operation, from the selection of wing spread until complete spread of the wings, should be nine to eleven seconds.



### MANUAL FOLDING

- 1** Pull out the landing gear control and wing fold control circuit breaker on left-hand console.
- 2** Pull wing fold handle to its full down position.
- 3** Unlock the lockpins by means of a special wing pin unlocking tool. Access to the lockpins may be gained through the wing fold lower access door.



- 4** Manually push wings to folded position and insert jury struts in each wing fold.

**Caution** Do not release wing panel from manually folded position until jury strut is installed. Cavitation of the wing fold cylinder during manual folding may result in a tendency to spread the wing panel automatically if the wing panel is released.



### MANUAL SPREADING

- 1** Remove jury strut.
- 2** With landing gear control and wing fold control circuit breaker pulled out, depress the handle on the wing fold manual lock valve.



**Note** This valve is located approximately in the center of the main wheel wells.

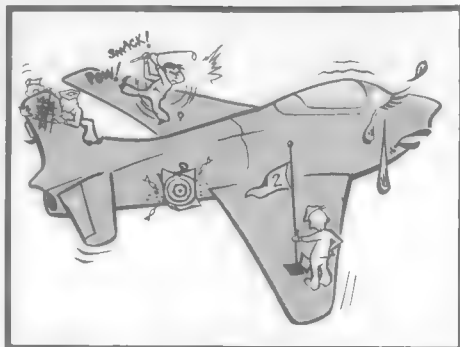
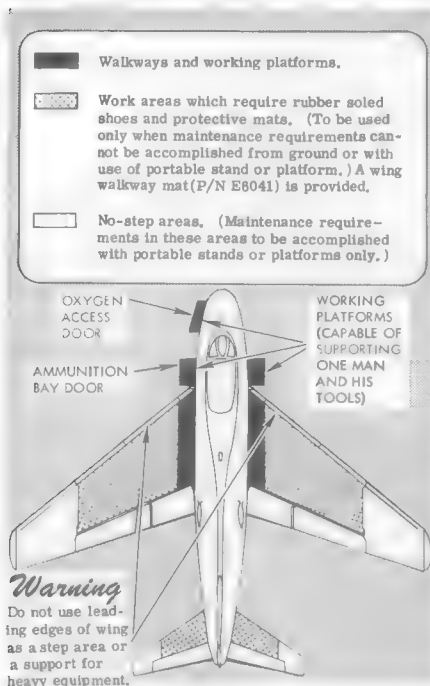
- 3** Manually spread the wings past the 90-degree position. From this position, the wings should spread without any external force.

**Warning** The wing panel may drop suddenly and cause structural damage to the wing if there is no hydraulic pressure in the lines. Provide support to the wing panel past the vertical position.

**Note** The lockpins will not engage when manually spreading wings until hydraulic pressure is applied.

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## 1-12. WALKWAYS AND WORKING PLATFORMS.



**Caution** The performance of the airplane at supersonic speeds is affected seriously when the aerodynamic efficiency of the skin surface is impaired by abrasions or scratches.

**Warning** One of the most common and most hazardous conditions is the misplacement of tools used for maintenance work. Extreme care should be taken to make sure that tools are replaced in the proper kit immediately after use. Do not set tools aside on or in the airplane where they may be forgotten. Do not place tools where they can be jarred free and drop into or on the airplane and cause a fouled system or a structural break. Tools should not be left on the airplane surfaces where they could be kicked or dropped and cause injury to personnel, damage to the airplane or generate a spark capable of igniting vapors.



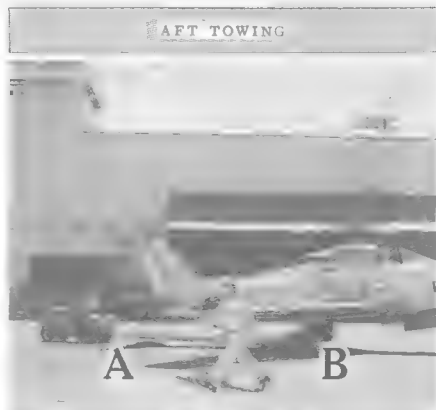


1-13. TOWING AIRPLANE.

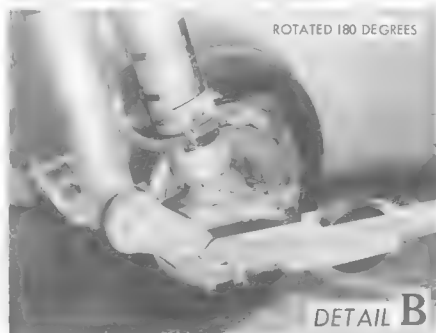
**Caution** Prior to towing, all ground servicing equipment and other obstructions should be moved clear of the airplane. A qualified man should be in the cockpit to operate the brakes as required and a responsible person near each wing tip to guide the movement of the airplane during towing.

- Towing speeds must be slow, without sudden starts or stops.
- Do not tow airplane unless external ground safety locks and pins are installed.
- Do not tow airplane with power on any of the electrical systems.

**Caution** If it is necessary to hand push the airplane, do not push on the rudder, elevators, ailerons, speed brakes, landing flaps or the pitot-static boom. These units are designed for stress in one direction only and are easily damaged. Push only on leading edges of wings (droop leading edge streamlined), horizontal stabilizers, solid parts of fuselage or landing gear.



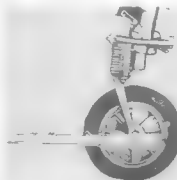
**Note** The E2605 tow bar is designed and used to tow the airplane aft and cannot be used for forward towing. To tow aft, attach the tow bar to the towing rings on the inboard side of each main landing gear.



FORWARD TOWING



To tow the airplane forward, use Navy universal tow bar (Part No. 601364) which attaches to the nose gear wheel axle.



FJ-48-2-55-15

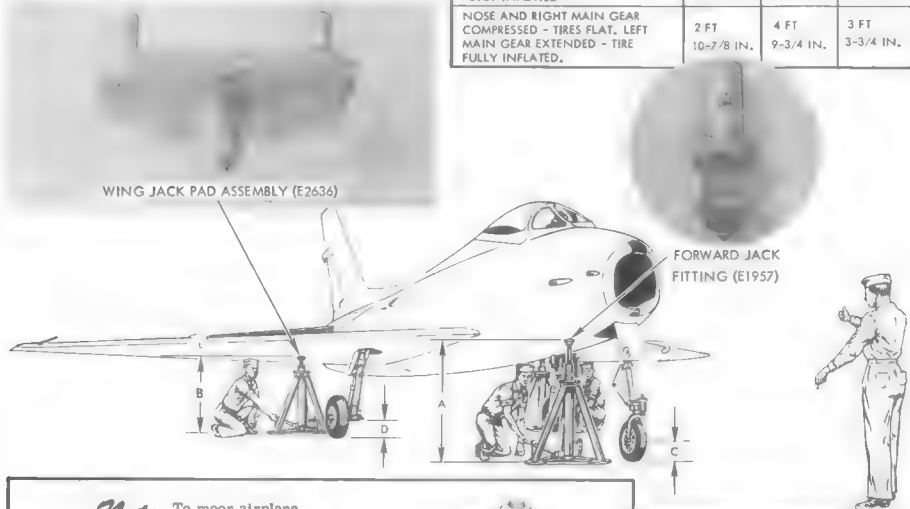
## 1-14. JACKING AIRPLANE.

**Note** Jack pads for wing and forward fuselage positions are found in the E2645 jacking, mooring and leveling kit. (Jack points on both sides of the fuselage just forward of the fuselage break are used when the wing is removed.) Jacks with a 10-ton capacity should be used.

**Caution** To keep the airplane as level as possible and to avoid overloading at either the wing or nose jacking points, jacking should be done simultaneously. To do this, one crew member should direct the entire jacking procedure by standing in front of the airplane and relaying instructions to the other crew members operating the jacks.

| DISTANCE FROM GROUND TO JACK PAD                           |                   |                   |            |           |
|--|-------------------|-------------------|------------|-----------|
| JACKING CONDITIONS   | A                 | B                 | C          | D         |
| WITH MAIN AND NOSE GEAR STRUTS AND TIRES PROPERLY INFLATED | 4 FT<br>2-7/8 IN. | 3 FT<br>4-3/4 IN. | 7 IN.      | 9-7/8 IN. |
| WITH AIRPLANE RAISED, TIRES 2 INCHES FROM GROUND           | 5 FT              | 4 FT<br>9-1/8 IN. | 10-1/4 IN. | 13 IN.    |
| WITH MAIN AND NOSE GEAR TIRE FLAT. GEARS FULLY COMPRESSED  | 3 FT<br>4-1/2 IN. | 3 FT<br>1/8 IN.   | 5-7/8 IN.  | 8 IN.     |

|  | B<br>RT WING       | B<br>LEFT WING      | A                 |
|--|--------------------|---------------------|-------------------|
| NOSE AND LEFT MAIN GEAR COMPRESSED - TIRES FLAT, RIGHT MAIN GEAR EXTENDED, TIRE FULLY INFLATED   | 4 FT<br>9-3/4 IN.  | 2 FT.<br>10-7/8 IN. | 3 FT<br>7-5/8 IN. |
| NOSE AND RIGHT MAIN GEAR COMPRESSED - TIRES FLAT, LEFT MAIN GEAR EXTENDED - TIRE FULLY INFLATED. | 2 FT<br>10-7/8 IN. | 4 FT<br>9-3/4 IN.   | 3 FT<br>3-3/4 IN. |

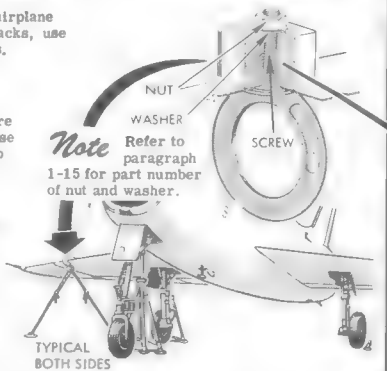


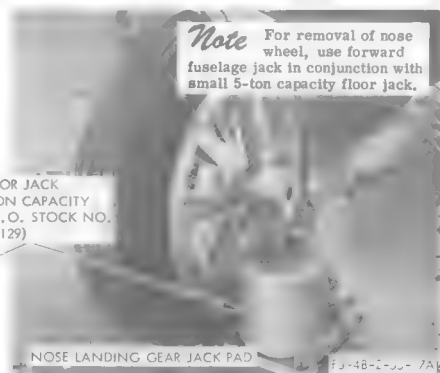
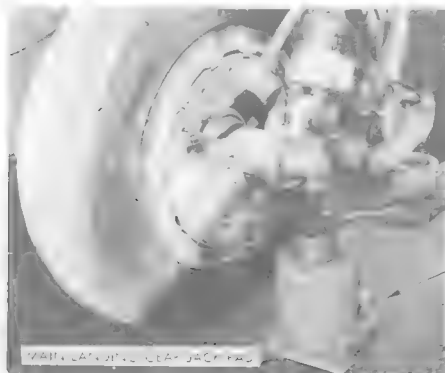
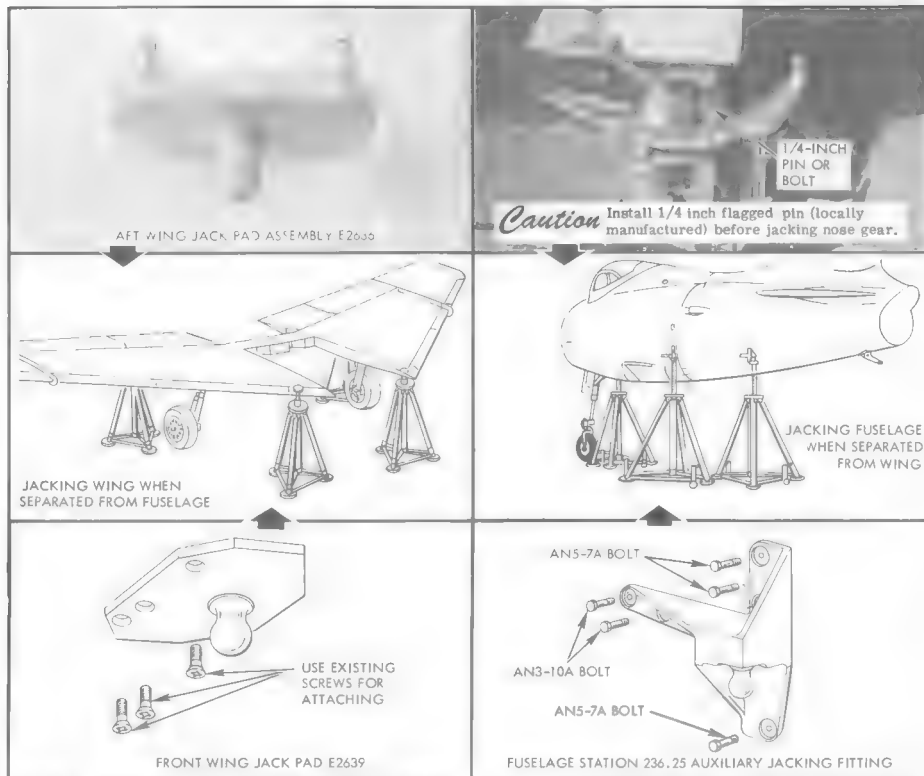
**Note** To moor airplane while on jacks, use E2637 mooring rings.

**Caution** These rings are designed for use while plane is on jacks. Not to be used for normal or heavy weather tie-down.

## TO INSTALL MOORING RING:

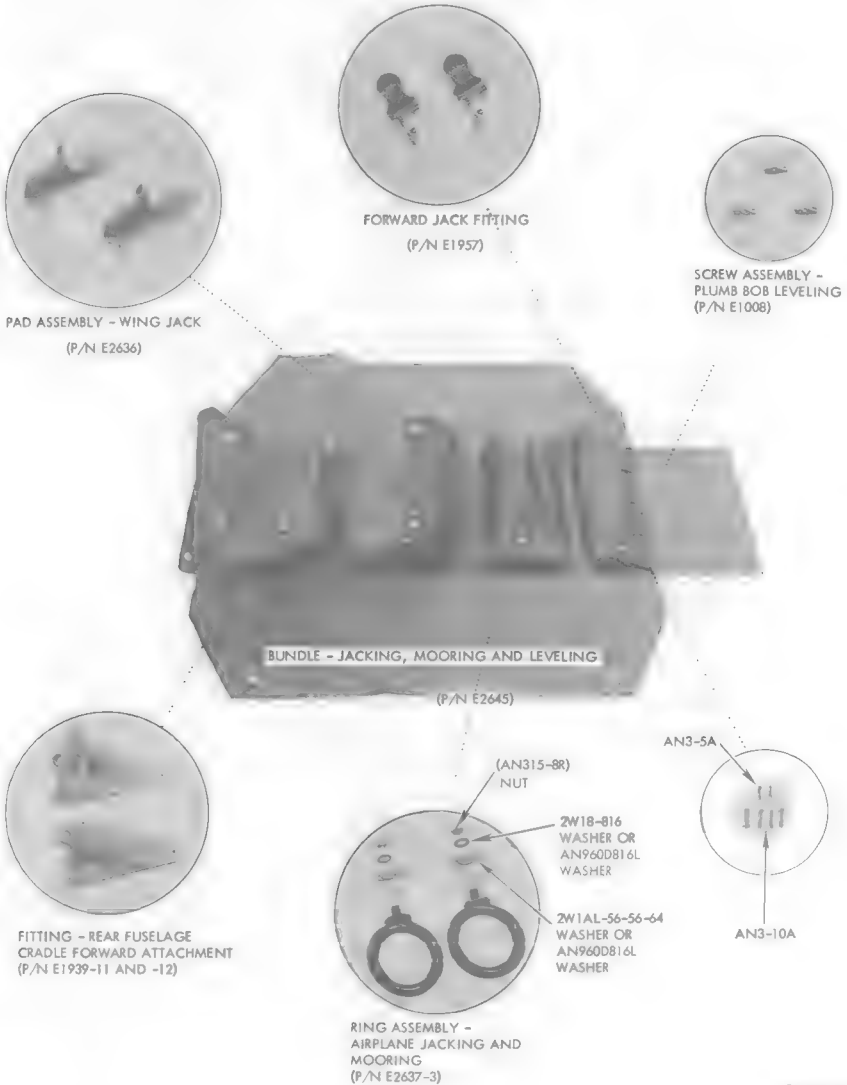
- 1 Remove access cover on top surface of wing.
- 2 Remove nut, washer and screw.
- 3 Install mooring ring as shown.







1-15. JACKING, MOORING AND LEVELING BUNDLE.



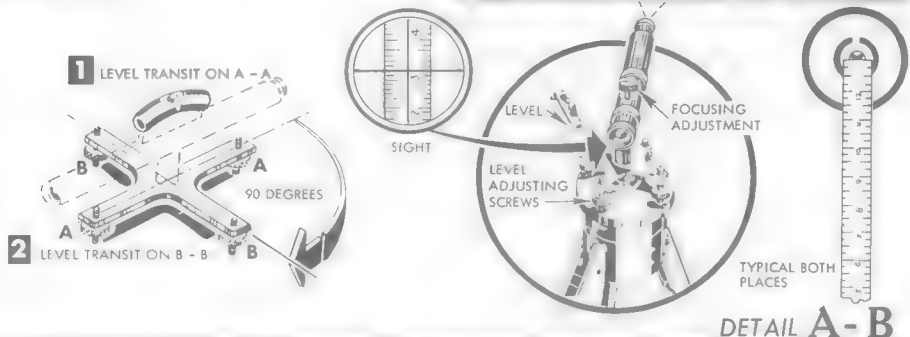
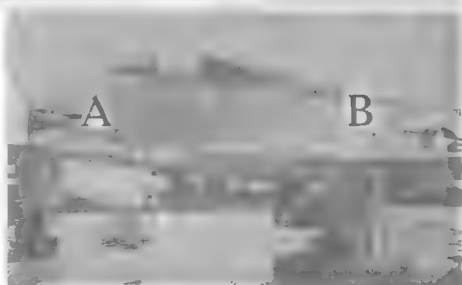
FJ-48-2-55-18

# 1-16. LEVELING AIRPLANE

## TRANSIT METHOD

- 1** Set up transit opposite left wing tip and level telescope with one set of adjusting screws.
- 2** Swing telescope 90 degrees and level with other set of adjusting screws.
- 3** Check first and second adjustments again to remove any minor misadjustments.
- 4** With assistant holding scale down from center of transit sighting points, level airplane by raising or lowering jacks until cross hairs in scope give identical reading on both scales. The number of inches below the transit sight is not important as long as the sight line crosses both scales at the same reading.

*Note* Transit tripod must not be moved after scope is leveled.

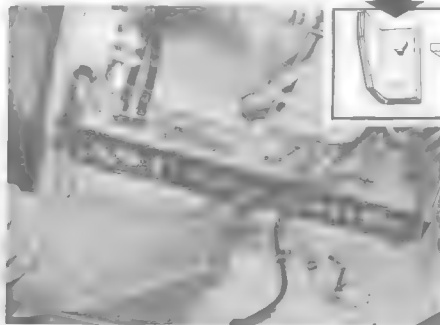


## BUBBLE LEVEL METHOD

- 1** Place level on leveling lugs on nose wheel well right and left web. Change wing jack heights to level laterally.

- 2** Use bubble level at longitudinal leveling lugs in nose wheel well. Adjust airplane position with nose jack.

*Caution* Do not use this leveling lug for leveling airplane by bubble level method.



FJ-48-2-55-19

## 1-17. GROUND HANDLING DOLLY.

Removal and installation of the aft fuselage and engine of the airplane may be accomplished by the use of a universal ground handling dolly with adapters. Although removing and installing the aft fuselage and engine using the hoisting slings provided may be done with greater ease and mobility, the universal ground handling dolly with adapters is highly recommended for shipboard use especially since it is less affected by the motions of the ship. The information provided herein utilizes the model 4000A ground handling dolly manufactured by the Air Logistics Corporation. To attach the ground handling dolly to the airplane proceed as follows.

## REMOVING

- 1** Check for security of wheel chocks; then level the airplane by deflating the nose gear strut and fully inflating the main gear struts.
- 2** Install two fittings, E1939-11 and -12 on left-hand and right-hand sides of forward part of aft fuselage by first removing the three screws on each side of fuselage which provide threaded holes for the bolts that attach the E1939 fittings.
- 3** Adjust the dolly for proper height and levelness. (See metal decal on dolly frame for operational data.) Slowly move the dolly forward until the adapters are in alignment with the fuselage attach points.

**Note** For ease of operation, the dolly should be rigged with the adapters positioned so that the aft end of the dolly may be pushed forward beneath the airplane.

- 4** After proper alignment is gained, set the dolly wheel brakes and the adjustable stanchions. Attach the forward and aft adapters to the aft fuselage. The forward adapters are attached with Ball-lok pins and the aft adapter is attached with a large knurled head bolt which screws into the aft fuselage just forward of the tail bumper.

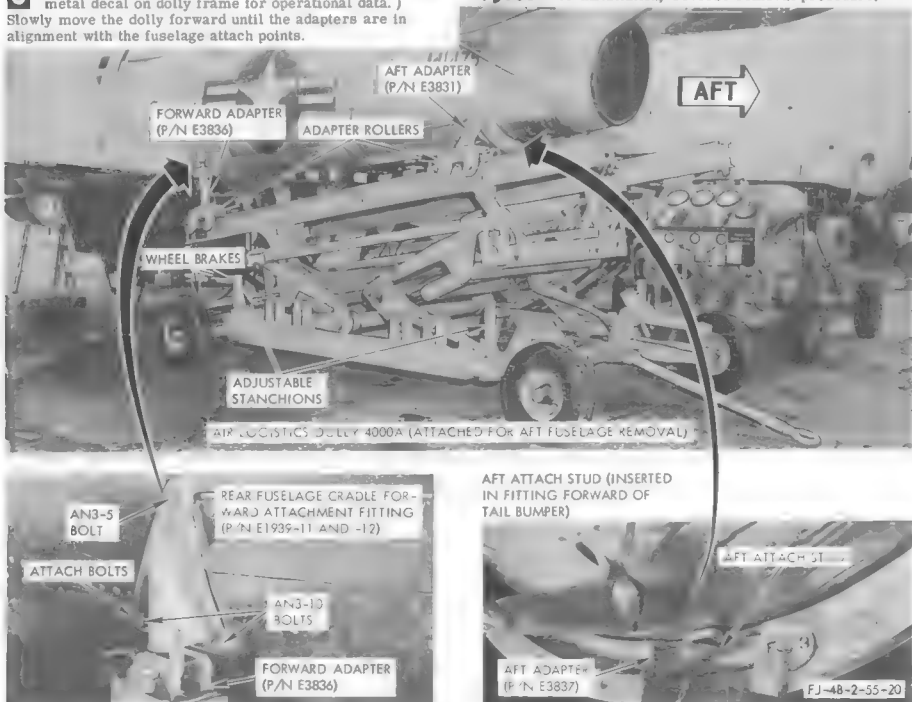
**Caution** There are two knurled head bolts provided on the aft adapter, one for FJ-3 type aircraft and one for FJ-4, -4B type aircraft. Do not attempt to use the FJ-3 bolt.

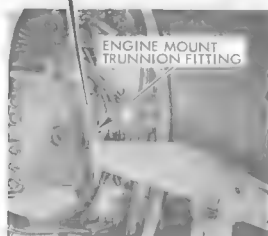
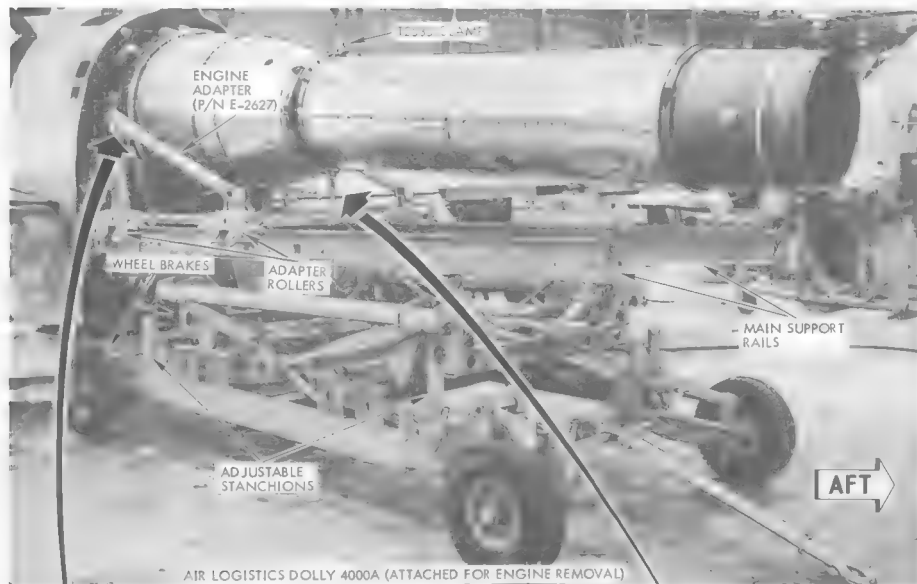
- 5** After the adapters are properly attached to the aft fuselage, tighten the adapter rollers and proceed with removal procedure as outlined in paragraph 2-8.

**Caution** Prior to removal of the aft fuselage, the engine tail-pipe clamp assembly (T2533) should be installed to support the tail pipe.

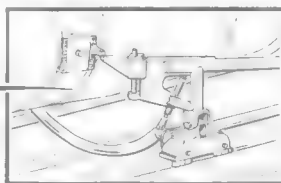
Do not open the aft speed brakes any time the dolly is attached to the aft fuselage.

**Note** For installation, reverse removal procedure.





REMOVAL



E-6551 ENGINE ADAPTER  
Vertical adjustment is provided for transferring the engine to engine manufacturer's various equipment.



**Note** Instructions of operational data may be found on a metal decal on dolly frame.

- 1** Check for security of wheel chocks; then level air-plane by deflating nose gear strut and fully inflating main gear struts.
- 2** Lower wing flaps. (This will provide more accessibility and working area and reduce the possibility of damaging the flaps while the ground handling dolly is in motion.)
- 3** Position ground handling dolly (with engine adapters installed) beneath engine and move forward until dolly main support rails are within one inch aft of fuselage break.
- 4** Set dolly wheel brakes and adjustable stanchions.

- 5** Elevate dolly main rails, making periodic adjustments for yaw, roll, tilt and lateral positions until engine adapters will mate with engine trunnion mount fittings and exhaust tail-pipe flange attach point.
- 6** Check for proper mating of engine trunnion mount fittings and attach aft support fitting.
- 7** Continue with engine removal procedure as outlined in paragraph 5-7.
- 8** After engine is clear of airplane, engine adapter roller units should be tightened to keep engine from moving on dolly main rails.

**Note** For installation, reverse removal procedures.

FJ-48-2-55-21A

## 1-18. HOISTING SLINGS.

## HOISTING EQUIPMENT

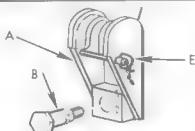
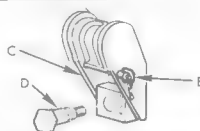
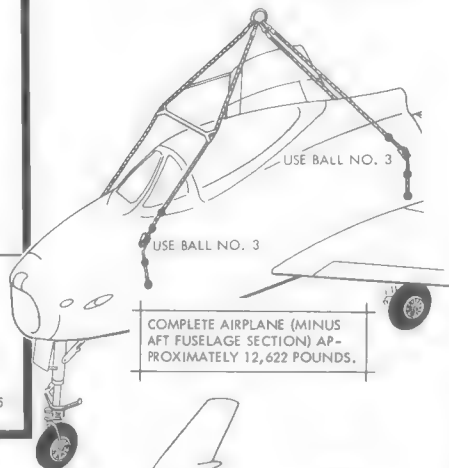
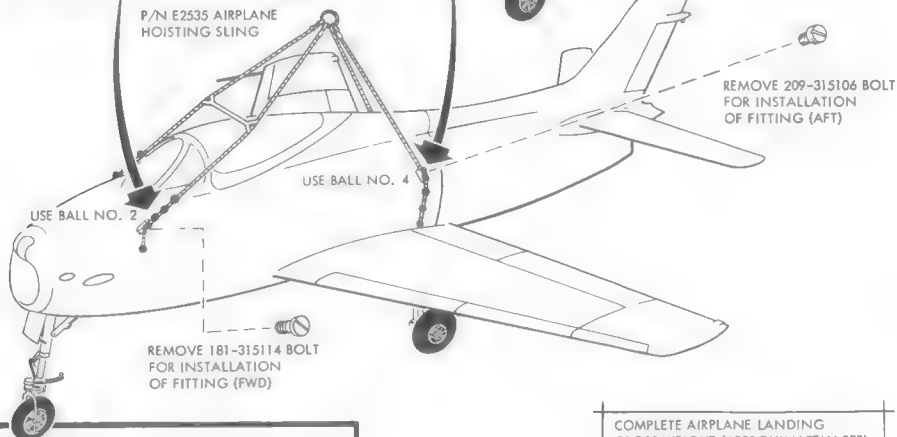
E1965 FITTING ASSEMBLY - FUS STA 52, FORWARD HOISTING,  
TWO REQUIRED

- A. E1959 FITTING - FUS STA 52, FORWARD HOISTING
- B. E1960 BOLT - FUS STA 52 AND 235-3/16, HOISTING
- E. BALL-LOK PIN (BL3-2.1875)

E1964-11 FITTING ASSEMBLY - FUS STA 235-3/16, AFT HOISTING,  
TWO REQUIRED

- C. E1963 FITTING - FUS STA 235-3/16, AFT HOISTING
- D. E2617 BOLT - FUS STA 235-3/16, HOISTING
- E. BALL-LOK PIN (BL3-2.1875)

**Caution** Do not use FJ-3, E1964 fitting assembly  
or E1960 bolt for Fus Sta 235-3/16 hoist  
point on FJ-4B airplanes.

TORQUE BETWEEN 235 AND 255  
INCH-POUNDSTORQUE BETWEEN 235 AND 255  
INCH-POUNDS.SWAGED BALLS ARE NUMBERED  
WITH NUMBER ONE BALL BEING  
AT THE END OF THE CABLES.COMPLETE AIRPLANE (MINUS  
AFT FUSELAGE SECTION) AP-  
PROXIMATELY 12,622 POUNDS.P/N E2535 AIRPLANE  
HOISTING SLING

USE BALL NO. 2

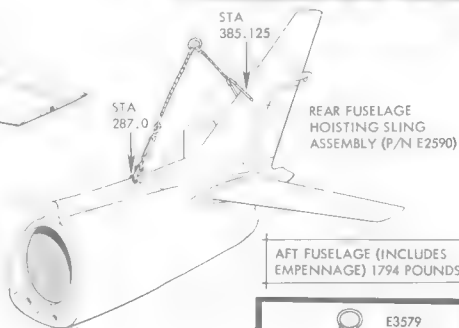
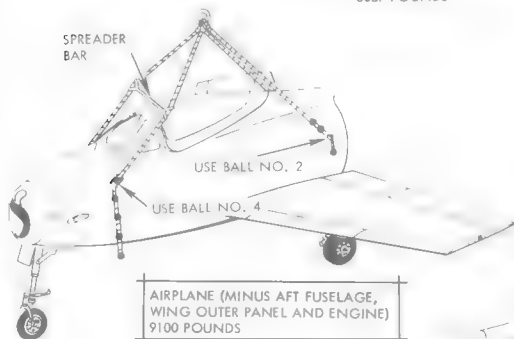
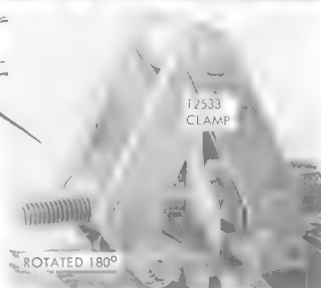
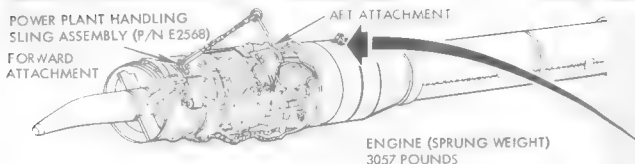
USE BALL NO. 4

REMOVE 181-315114 BOLT  
FOR INSTALLATION  
OF FITTING (FWD)REMOVE 209-315106 BOLT  
FOR INSTALLATION  
OF FITTING (AFT)

| CONFIGURATION                 | BALL NO. | FWD<br>CABLE | AFT<br>CABLE |
|-------------------------------|----------|--------------|--------------|
| COMPLETE AIRPLANE LANDING     |          |              |              |
| GROSS WEIGHT                  | 2        | 4            |              |
| COMPLETE AIRPLANE EMPTY       | 2        | 4            |              |
| FWD FUS WING AND ENGINE       | 3        | 3            |              |
| FWD FUS AND WING              | 4        | 2            |              |
| FWD FUSELAGE                  | 5        | 1            |              |
| PROOF-LOADED TO 40,000 POUNDS |          |              |              |

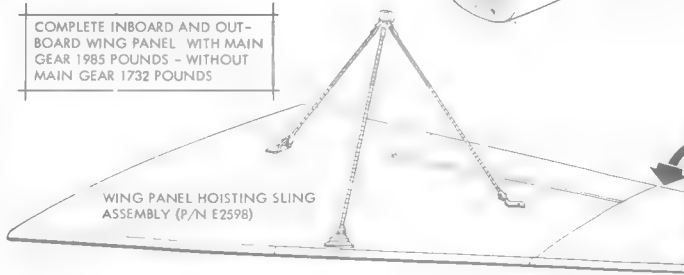
COMPLETE AIRPLANE LANDING  
GROSS WEIGHT (APPROXIMATELY 20%  
FUEL LOAD PLUS AMMUNITION)  
15,875 POUNDS. COMPLETE  
AIRPLANE EMPTY 14,416 POUNDS.

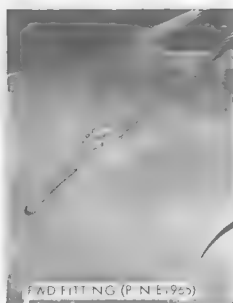
FJ-4B-2-55-22



AFT FUSELAGE (INCLUDES  
EMPENNAGE) 1794 POUNDS

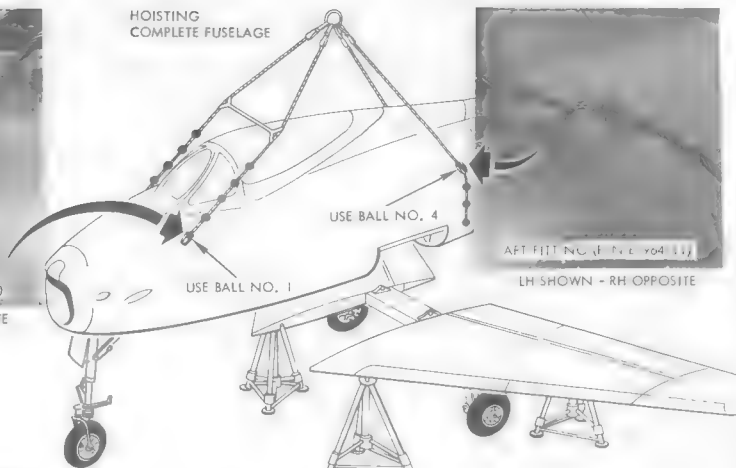
COMPLETE INBOARD AND OUT-  
BOARD WING PANEL WITH MAIN  
GEAR 1985 POUNDS - WITHOUT  
MAIN GEAR 1732 POUNDS



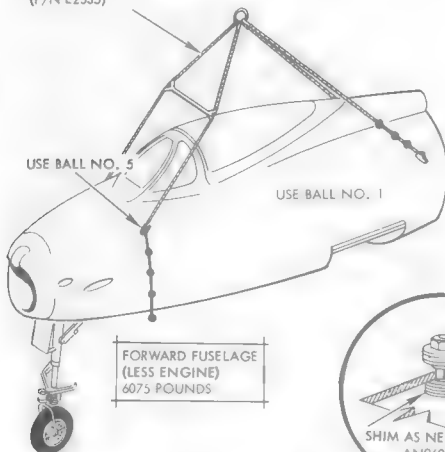


FWD FITTING (P/N E1955)  
LH SHOWN - RH OPPOSITE

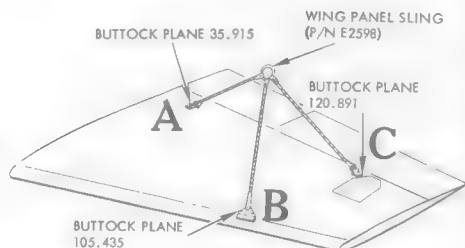
HOISTING  
COMPLETE FUSELAGE



COMPLETE AIRPLANE  
HOISTING SLING ASSEMBLY  
(P/N E2535)



FORWARD FUSELAGE  
(LESS ENGINE)  
6075 POUNDS



BUTTOCK PLANE 35.915

WING PANEL SLING  
(P/N E2598)

A

BUTTOCK PLANE  
120.891

C

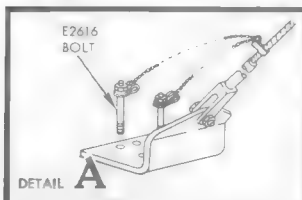
BUTTOCK PLANE  
105.435

COMPLETE INBOARD WING  
PANEL WITH MAIN GEAR  
1985 POUNDS - WITHOUT  
MAIN GEAR 1536 POUNDS

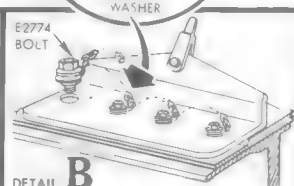
**Note** Sling may be used  
with or without out-  
board wing panel.



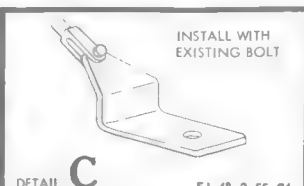
SHIM AS NEEDED WITH  
AN960D10L  
WASHER



DETAIL A



DETAIL B



DETAIL C

INSTALL WITH  
EXISTING BOLT

FJ-48-2-55-24

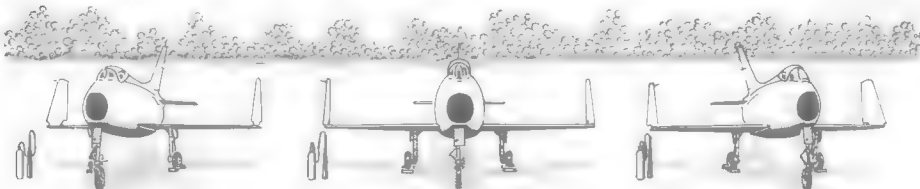
1-19. PARKING AND MOORING.

PARKING

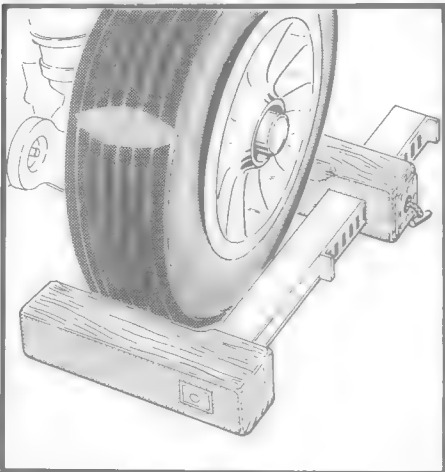
**1** In so far as possible, the airplane should be parked a wing span from other airplanes. This is done to provide adequate fire lanes, safe distance for maneuvering the airplane on the ground, and free space for ground servicing equipment.

*Caution*

- The cockpit should be manned until chocks have been placed.
- The airplane does not have a parking brake.



**2** Chock landing gear wheels.



**5** Place a low-resistance ground wire from bare metal on the airplane to the ground or deck.

**6** Lock the rudder pedals in the neutral position.



The locking of the rudder is accomplished by raising the two rudder pedal locks, positioning the rudder pedals which have been pulled down and aft to the cockpit floor under the pedal locks, and locking the rudder pedal adjustment in full mid (neutral) position. No surface control locks are required for the stabilizer and elevator.

**3** Install nose and main landing gear ground safety locks and pins. (See figure 1-14.) Check warning flag attachment.

**4** Install pitot tube cover, angle-of-attack and angle-of-saw probe covers, air intake shield and exhaust tail-pipe shield. (Refer to paragraph 1-20.)

**Warning** Stay clear of tail-pipe exhaust area during engine cooldown. If the airplane is to be hangared, wait at least 15 minutes after engine shutdown.

**7** Above 60-knot winds, with wings folded, jury struts must be installed. It is recommended that jury struts be installed on folded wings if the airplane is to be parked for an extended period of time.

**8** If climatic and weather conditions permit, keep the canopy slightly open. Direct sunlight and high temperatures can cause the acrylic plastic canopy to crack or craze.

FJ-48-2-55-25

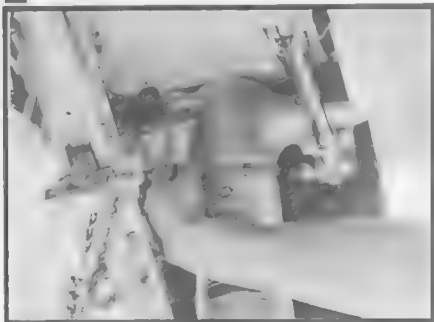


## MOORING

**Note** Information from aerology as to wind velocities and temperatures will be the determining factors for the Squadron Duty Officer to use for mooring and protective cover requirements.

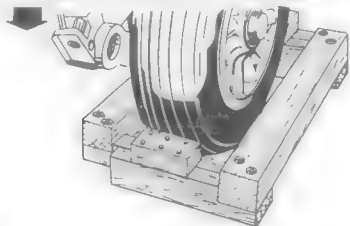
- 1** Park the airplane as previously instructed and ascertain that the relative wind is not more than 45 degrees left or right of dead ahead.

- 2** Deflate nose gear strut.

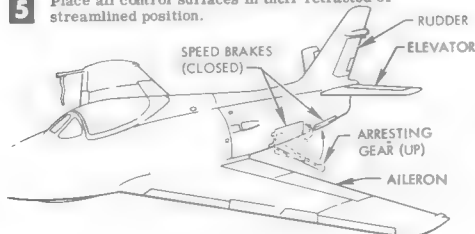


- 3** If time permits, fill fuel system to capacity, including drop tanks if installed.

- 4** Secure chocks by nailing wood cleats from chock to chock on each side of the wheel. Use lines to secure chocks when wood cleats are not available.



- 5** Place all control surfaces in their retracted or streamlined position.



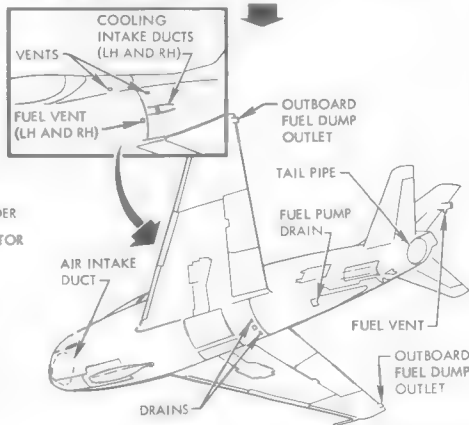
**Warning** Structural damage can occur from high velocity surface winds. Therefore, if at all possible, the airplane should be hangared or evacuated to a safe weather area if a tornado, hurricane, or winds above 100 knots are expected.

- 6** Disconnect battery.

**Note** If the airplane is to be moored longer than the necessary requirement for a periodic check of the battery, remove battery from the airplane.

- 7** Secure all access doors and panels.

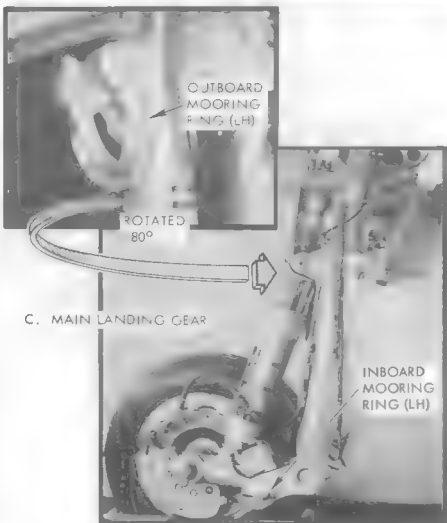
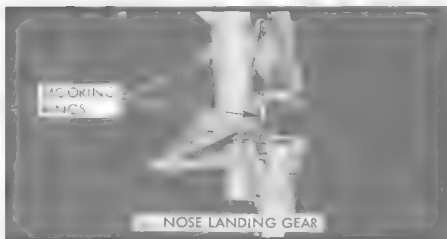
- 8** As climatic conditions dictate, install all protective covers as necessary. If dust, sand and other debris are expected during mooring, tape all openings such as drains, vents, etc.



FJ-4B-2-55-26

**9** Tie-down points are provided on the airplane at the following locations:

- A. Nose gear strut (two rings)
- B. Aft fuselage (one hole in tail bumper)
- C. Main gear strut (two rings each - LH and RH)



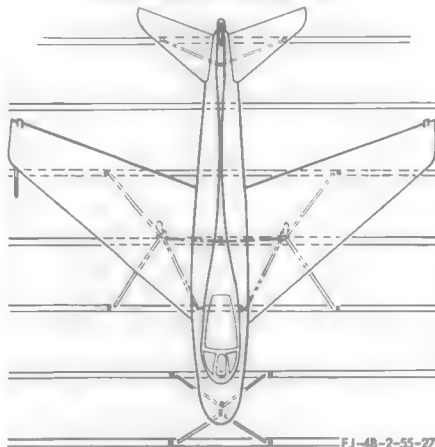
**10** The tie-down should be made of cables (3/16-inch), lines (3/4-inch), or chains (suitable for 3000 pounds pull-test). Tie-down should be approximately 45 degrees to the ground line. When using 3/16-inch aircraft cables, secure with wire rope clips. When using chains, secure with aircraft steel bolts. When using 3/4-inch lines, allow sufficient slack between ground mooring anchors and airplane's mooring rings to prevent undue stress or strain on the airplane structure in the event of accidental tire or strut deflation on the opposite side, or line shrinkage from moisture. Avoid excessive slack. Slip knots will not be used in tying mooring lines. Half hitch or bowline knots will be used.



TYPICAL TIE-DOWN KNOTS UTILIZING 3/4-INCH MANILA LINES

**11** Remove any maintenance stands or loose equipment from the vicinity of the airplane.

SUGGESTED TIE-DOWN ARRANGEMENT

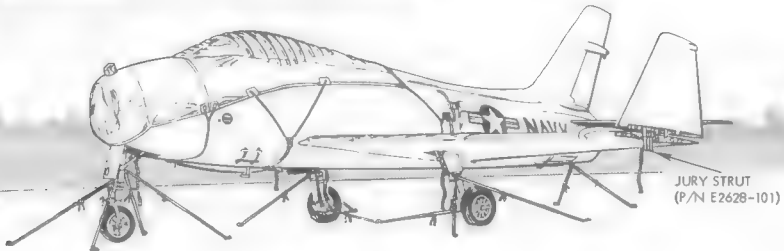




Install aileron battens at wind velocities of 60 knots.


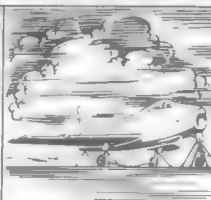

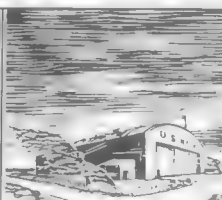
Aileron battens are provided to lock the ailerons in the neutral position. The batten is composed of an upper and lower section and is attached by the use of "wing" bolts.

**Warning** Remove aileron battens before flight.



#### MOORING IN HEAVY WEATHER

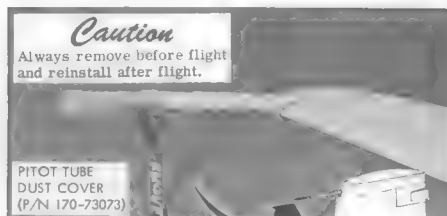
**Caution** Heavy cables or chains should be used for a heavy weather tie-down.

| AIRPLANE FULLY SERVICED - TAKE-OFF GROSS WEIGHT CONDITION *                        |  |  |   |
|--|--|--|---|
|  |  |            |  |
| TIE-DOWN NOT REQUIRED.   | * NORMAL TIE-DOWN REQUIRED.  | * HEAVY WEATHER TIE-DOWN INCLUDING AILERON BATTENS. INSTALL JURY STRUTS IF WINGS ARE FOLDED. | EVACUATE AIRPLANE TO SHELTERED AREA.  |
| 0 TO 20  | 20 TO 60   | 60 TO 100  | ABOVE 100   |

WIND VELOCITY - KNOTS

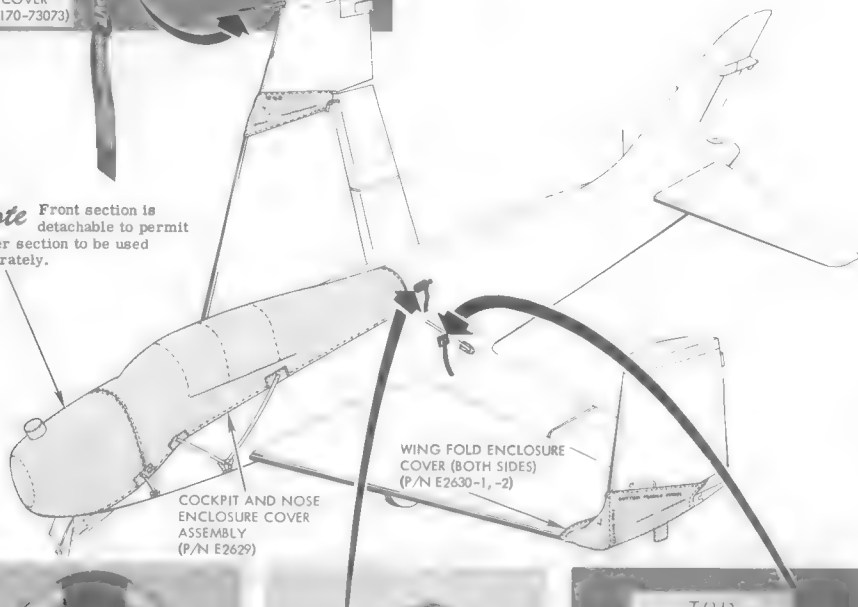
FJ-48-2-55-28

1-20. PROTECTIVE COVERS.



**Warning** Allow engine to cool before installing engine intake shield and exhaust tail-pipe shield. Warm air contains more ice-forming moisture than the same volume of cool air.

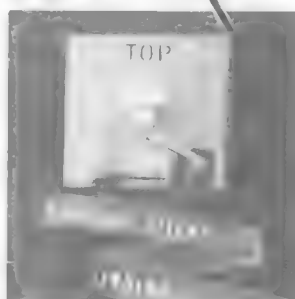
**Note** Front section is detachable to permit either section to be used separately.



ENGINE AIR INTAKE SHIELD (P/N 194-73061)

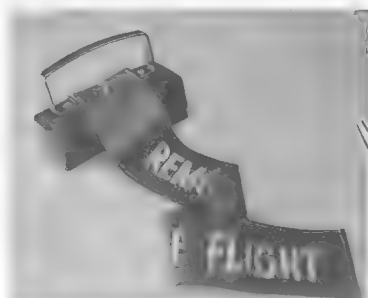


ENGINE TRUNNION COOLING PLUG (BOTH SIDES) (P/N E2623)

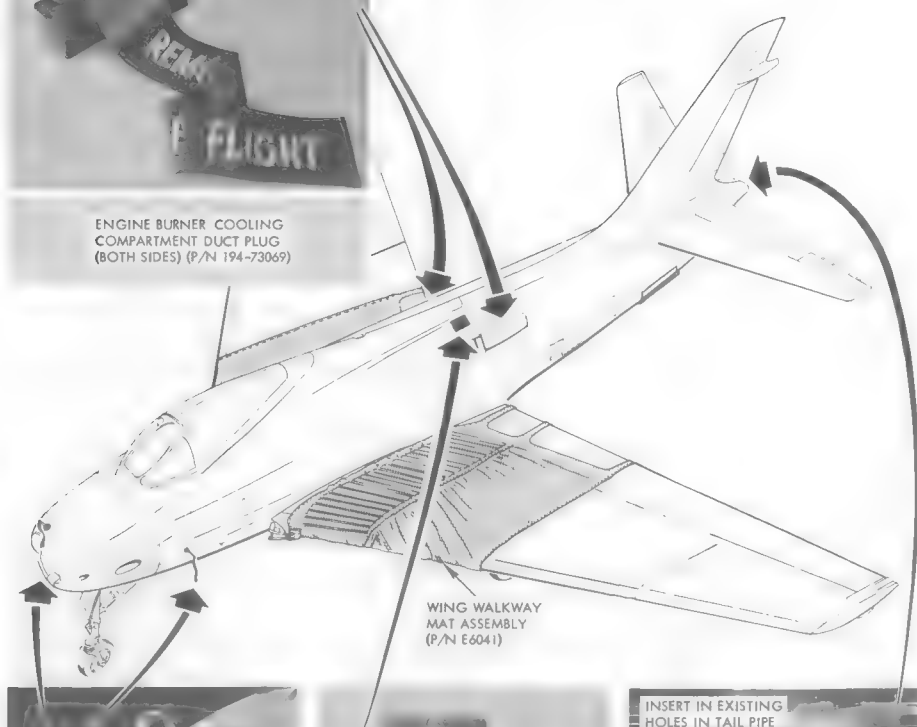


HEAT EXCHANGER OUTLET PLUG (P/N E2633)

FJ-4B-2-55-29



ENGINE BURNER COOLING  
COMPARTMENT DUCT PLUG  
(BOTH SIDES) (P/N 194-73069)



WING WALKWAY  
MAT ASSEMBLY  
(P/N E6041)



ANGLE-OF-ATTACK  
AND ANGLE-OF-YAW  
PROBE COVERS  
(P/N 181-51032)



COMPRESSOR COMPARTMENT  
AIR BLEED DUCT COVER (BOTH  
SIDES) (P/N E2634)



INSERT IN EXISTING  
HOLES IN TAIL PIPE

ENGINE EXHAUST TAIL-PIPE  
SHIELD (P/N E2631)

FJ-48-2-55-30

1-21. AIRPLANE STORAGE.

AIRPLANE STORAGE

When the airplane is to be placed in storage, it is necessary that the proper preservation procedures be taken. Unless otherwise stated, the (✓) marks on the following pages indicate a storage period of approximately 30 days. The variables of local climatic conditions have been excluded. Due to the many types of preservation requirements on Naval airplanes, the check procedures listed on these pages should be considered as general information only. Where a specific type of preservation is required, it is suggested that responsible personnel consult current directives and instructions.

AIRPLANE GENERAL

**Warning** Remove all explosive charges from the emergency escape system prior to storage. This includes the ejection seat catapult cartridge, canopy remover and exactor, primary and secondary initiators and the cartridge in the automatic lap belt actuator.

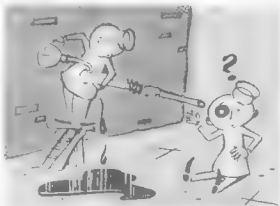
- (✓) Remove salt water deposits and debris from the airplane interior and exterior.
- (✓) Open all moisture drain holes.
- (✓) If necessary, treat corroded areas in accordance with applicable instructions.
- (✓) Lubricate the airplane following the procedures outlined in paragraph 1-53.
- (✓) Install all protective covers. (Refer to paragraph 1-7.)

**Note** Install cockpit and fuselage nose cover to prevent rain from entering the cockpit. If cover is used, the canopy should be left slightly open to allow for venting and circulation of air. If cockpit area is not covered, periodically open the canopy for venting.

- (✓) Install jury struts on folded wings and secure aileron control surfaces with battens.
- (✓) Seal openings on upper surfaces that will allow water to be trapped.
- (✓) Ventilate as much as possible by opening access doors where water will not enter.

ARMAMENT

- (✓) Lubricate 20mm guns in accordance with instructions shown in paragraph 1-53 and allow to remain in airplane.
- (✓) Install plugs in each of the gun ports.
- (✓) Make certain gun compartments and ammo compartments are sealed against moisture and rain.
- (✓) Drain moisture from air bottle of pneumatic gun charging system to prevent corrosion while airplane is in storage. Because of pneumatic system leakage, it is necessary that the system contain at least 300 psi when placed in storage. This will ensure that no atmospheric air flows into the system, thereby minimizing the amount of moisture which may affect the system. Use only dry air or nitrogen when servicing. Check the condition of the chemical drier cartridge and, if necessary, replace the cartridge. When reactivating the pneumatic system, make certain to re-check the chemical drier for condition and check the air compressor oil level.



## ENGINE

The following preservation treatment should be accomplished on installed engines which will not be in operation for a period of 30 days. A second period under this protection is allowable only if the airplane is flown between storage periods.

- (M) At the beginning of the storage procedure, start the engine using the lubricating oil specified for the engine.
- (M) Operate the engine at 55 percent rpm for ten minutes. Then shut down the engine.

**Note** Starting, operating and shutdown procedures shall be in accordance with paragraph 1-9.

- (M) Seal the engine openings with protective covers as shown in paragraph 1-7.

The following preservation treatment should be accomplished on installed engines that cannot and will not be flown at the end of a 30-day period, but which will be in operation within a 120-day period.

- (M) Drain the engine oil to minimize contamination of the corrosion-preventive mixture.
- (M) Fill the engine oil system with corrosion-preventive mixture (item 42, materials list).
- (M) Operate the engine at 55 percent rpm for ten minutes.

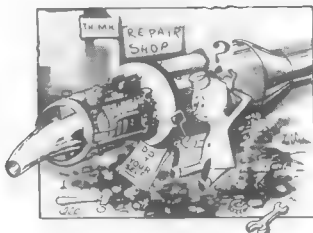
**Note** Starting, operating and shutdown procedures shall be in accordance with paragraph 1-9.

The exhaust gas temperature should be maintained within the specific limits required for the engine.

- (M) After run-up is completed, wait for the engine to cool; then spray the compressor blades with corrosion-preventive mixture (item 42, materials list). Spray the compressor blades during the time that the engine is being motored only. Do not operate starter in excess of 50 seconds. It is necessary to allow for a 20-minute interval between each of the 50 second runs.

**Caution**

- Do not spray compressor until the engine has cooled sufficiently to prevent flash fire.
- Ground the ignition system to prevent accidental firing of engine during spraying operation. (See figure 5-8.)



- (M) Drain the engine fuel system in the following manner: through the lower engine access door, remove the plugs from the aneroid chamber drain, spin chamber access port and the compressor pressure limiter drain. The aforementioned parts are all included in the fuel control unit. [ Refer to the Handbook of Service Instructions (AN 02B-35AAC-2). ] Reinstall all plugs when drainage is completed. Through the right-hand engine access door, disconnect the fuel inlet line to the engine-driven fuel pump at the pump connection and attach a hose from an approved preserving unit filled with oil (Specification MIL-O-6081, Grade 1010) which will supply filtered slushing oil at gravity feed. Disconnect one fuel distributor line at No. 1 fuel distributor. With the power control lever in the full open position, motor the engine while adding slushing oil. Stop motoring and oiling when oil (fuel free) flows from the No. 1 fuel distributor.

**Caution** Disable the ignition system to prevent accidental firing of the engine during the slushing operation. (See figure 5-8.)

**Note** To prevent oil splash-back from the slushing hose, the power control lever must never be in "OFF" position during motoring.

- (M) Move the power control lever to "OFF" position during engine run-down. Disconnect the slushing hose and reconnect the fuel inlet line and the No. 1 fuel distributor line.



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### FUEL SYSTEM

- (✓) When it is known that the fuel cells will not contain fuel for a period in excess of 10 days, the inside surfaces of the cells should be coated with oil (Specification MIL-O-6081, Grade 1010). Coating may be accomplished by spraying or filling and draining.
- (✓) Fuel system completely filled with fuel during airplane storage.
- (✓) Check fuel system each week for completely filled condition.

### DROP TANKS

- (✓) Drop tanks completely filled with fuel during airplane storage.
- (✓) Coat inside surfaces of drop tanks with oil the same as a fuel system cell when it is to remain empty for a period in excess of 10 days.

### LANDING GEAR

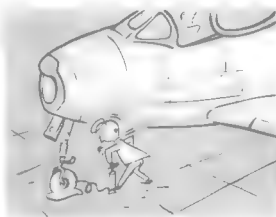
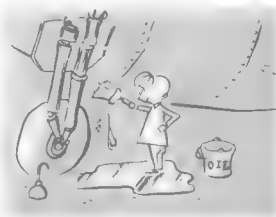
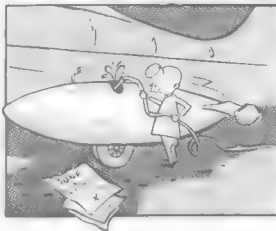
- (✓) Make certain landing gear ground safety locks and pins are installed. (Refer to paragraph 1-14.)
- (✓) Check that the shock struts are properly extended. (Refer to paragraph 1-43.)
- (✓) Check that tires are properly inflated. (Refer to paragraph 1-46.)
- (✓) Install locally fabricated wheel covers during storage period.
- (✓) If it is possible, block up the airplane to minimize the possibility of tire damage.

Coat all unpainted and polished parts of the landing gear with hydraulic fluid (item 95, materials list).

Tires shall not be allowed to remain depressed at one area by the weight of the airplane for more than two weeks.

### RADIO AND RADAR

- (✓) Make certain radio and radar compartments are sealed against moisture or rain.
- (✓) During relatively short storage periods, periodic operation (dependent on local directives) of radio and radar equipment will minimize the presence of moisture and will eliminate the need for removal of the equipment.
- (✓) During extended periods of storage, it will be necessary to remove all radio and radar equipment and repackage in its original or equivalent packaging.





**HYDRAULIC SYSTEM**

- (V) Relieve the air pressure from the No. 1 and No. 2 flight control system accumulators, the emergency nose gear extension accumulator and the arresting gear snubber.
- (V) Completely fill the nose gear emergency accumulator (from the fluid side) with hydraulic fluid (item 95, materials list).
- (V) To prevent damage to the flight control systems because of inactivity, the horizontal stabilizers and ailerons should be actuated through ten full throws every 2 weeks of the storage period. Use the No. 1 and the No. 2 flight control systems for this operation.
- (V) The arresting hook should be retracted for storage.
- (V) Landing gear doors should be closed to keep dirt out of the wheel wells.
- (V) Speed brakes should remain in closed position.
- (V) Wings should be in spread position; however, storage of the airplane with folded wings is permissible. Install jury struts and apply corrosion-preventive compound (item 44, materials list) to all joints and rod ends. Install wing fold covers.
- (V) Make certain that hydraulic system is filled during airplane storage period.

**INSTRUMENTS**

- (V) All instruments are to remain installed in the airplane.
- (V) The airplane clock may be removed and packaged depending on local directives.
- (V) Make certain that the pitot-static sumps are drained prior to placing the airplane in storage. Except for extreme conditions, no further draining is necessary. In areas where extreme night and day temperatures produce excessive moisture accumulation, frequent draining is necessary.

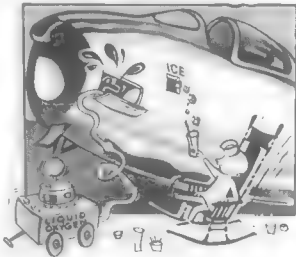
**OXYGEN SYSTEM**

- (V) Drain the liquid oxygen from the system then fill the system with gaseous oxygen to 70 psi using the test gage assembly illustrated in figure 4-31.

**Caution**

The gaseous oxygen shall be released and the system purged prior to refilling with liquid oxygen. (Refer to paragraph 4-123.)

- (V) Seal pilot's oxygen hose in cockpit.

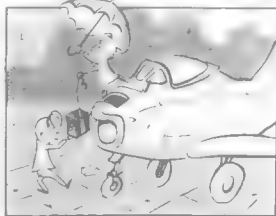
**BATTERY**

- (V) When the airplane is being stored for a period of 30 days, the battery may be left in the airplane and the specific gravity checked weekly.

**Note**

The battery should be removed from the airplane and taken to the battery shop when storage periods exceed 30 days.

- (V) On installed batteries, secure battery leads away from battery terminals and preserve terminals with grease (item 82, materials list).
- (V) Clean battery areas and neutralize corrosion by scrubbing with a ten percent soda solution followed by a thorough fresh water rinse.



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**CARRIER DECK HANDLING****1-22. CARRIER DECK HANDLING.**

1-23. During various deck handling operations and procedures, the precautions in the following paragraphs must be observed to prevent damage to the airplane and especially to prevent injury to personnel performing the carrier deck operations.

**Note**

Paragraphs 1-7 through 1-21 should be thoroughly understood. All safety precautions, procedures and illustrations in these paragraphs also apply to carrier deck handling.

**1-24. SAFETY PRECAUTIONS.**

1-25. An airplane is an expensive mechanism worth many thousands of dollars and should be handled with respect and care. Observe the following precautionary measures:

a. Smoking is prohibited on the hangar deck and flight deck at all times.

b. Each airplane on the hangar deck should at all times be grounded to the deck, except when actually in motion, because of the danger of fire caused by static electricity.

c. All airplanes should be secured with chains or cables, using two on each main gear, two on the nose gear and one on the tail.

d. Chocks should be used on both main landing gear wheels.

e. Airplanes should be parked so that a fore and aft passageway amid ships is clear to fire fighting equipment.

f. Jet intake screens should be installed any time the airplane is on the ground and should be removed prior to flight.

g. In starting the airplane engine in the hangar, caution must be exercised in regard to the fumes. The following ventilation and safety measures must be observed: (1) All hangar roller curtains must be kept open. (2) All airplanes to be turned up must be tailed toward hangar openings. (3) All hangar doors and hatches in the vicinity, through which personnel might walk, must be roped off and guarded. (4) Fire fighting equipment in the vicinity must be manned as well as all conflagration control stations. (5) Exhaust ventilation fans must be kept in constant operation.

h. Rudders, elevators, ailerons, speed brakes and landing flaps should not be used to push the airplane. These units are designed for stress in one direction only and are easily damaged. Push only on leading edges of wings (droop edge streamlined), horizontal stabilizers, solid parts of fuselage or landing gear.

**1-26. OPERATIONAL PRECAUTIONS.**

1-27. Operational precautions are as follows:

a. Never cross the flight deck in front of or near the tail of any airplane that is turning up, taxiing or on the catapult.

b. Do not get in the line of fire of any gun at any time. The guns on the airplane are low, level and deadly.

c. Only authorized personnel are permitted in or on the airplane.

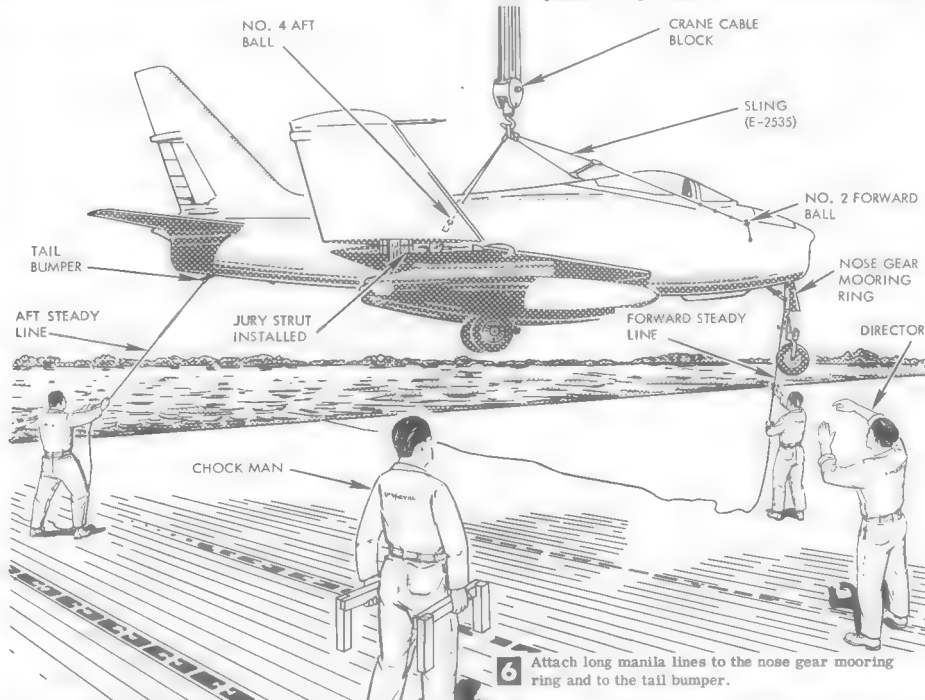
d. Fuel or oil spilled on the deck should be cleaned up immediately.

e. Due to the enormous quantities of aviation fuel carried and the necessary plumbing to various parts of the ship, fires are an ever present hazard on all aircraft carriers. Such fires can be prevented only by constant vigilance and strict compliance with safety orders.

# 1-28. HOISTING AIRPLANE.

Complete airplane landing gross weight (approximately 20% fuel load plus ammunition) - 15,875 pounds.

**Warning** At no time should personnel be in the area directly beneath the airplane while the airplane is being hoisted.



**6** Attach long manila lines to the nose gear mooring ring and to the tail bumper.

Preparing the airplane for hoisting is of utmost importance. The steps listed below should be strictly adhered to.

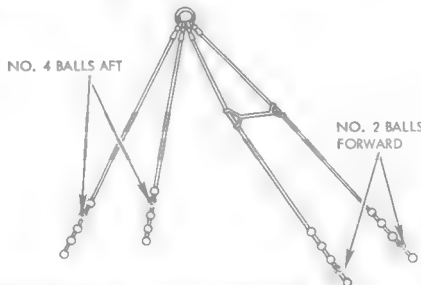
- 1** Remove 181-315114 bolt for installation of fitting (forward).
- 2** Remove 209-315106 bolt for installation of fitting (aft).
- 3** Attach E1965 fitting assembly, fuselage station 52 (forward).
- 4** Attach E1964-11 fitting assembly, fuselage station 235-3/16 (aft).

**Warning** Do not use FJ-3 E1964 fitting assembly and E1960 bolt for station 235-3/16 hoist point on FJ-4B airplane.

- 5** Attach E2535 sling using No. 2 balls forward and No. 4 balls aft. Insert pins BL-3-2.1875 in E1965 and E1964-11 fitting assemblies.

**Caution** Make sure the cockpit canopy is closed. While installing the sling, use caution so as not to damage the cockpit canopy with the spreader bar.

**Caution** Steadying lines must be manned any time the airplane is being lifted or lowered.

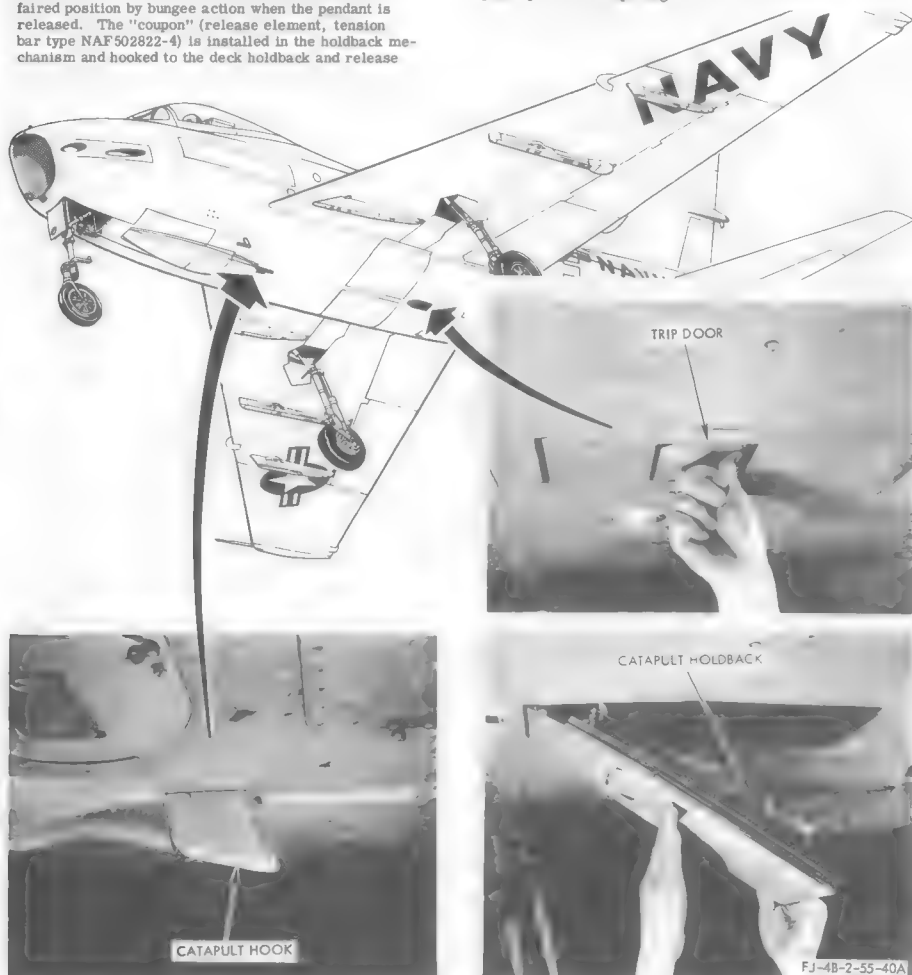


**Warning**

## 1-29. CATAPULTING AIRPLANE.

The catapult system consists of a pivoted catapult hook attached at the forward lower centerline of the fuselage and a holdback mechanism located on the outer lower centerline of the fuselage just forward of the fuselage break. The pendant (NAF31555-1) is attached to the catapult with the hook in the normal position. As the catapult is tensioned and the airplane catapulted, the hook lines up with the load path and returns to the faired position by bungee action when the pendant is released. The "coupon" (release element, tension bar type NAF502822-4) is installed in the holdback mechanism and hooked to the deck holdback and release

cleat link unit (NAF315549-1); tension force keeps the airplane holdback open. When the "coupon" breaks, the holdback mechanism automatically retracts and the forward end of the "coupon" is retained in the airplane holdback mechanism. The catapult holdback mechanism pendant and carry through structure are designed to withstand the catapult pretensioning force that is imposed prior to catapulting.

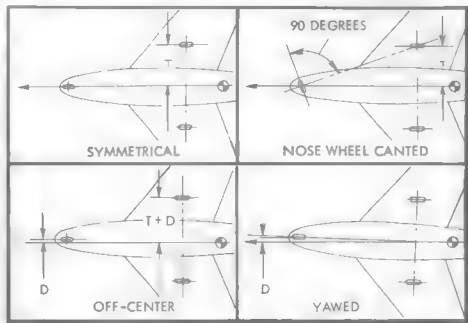
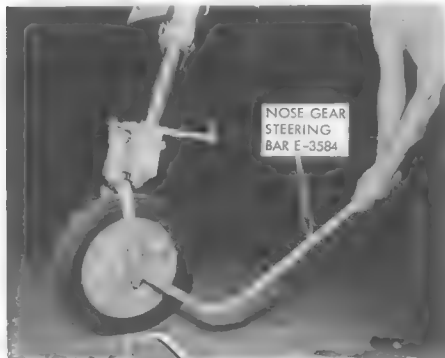


**Section I**  
**Carrier Deck Handling**

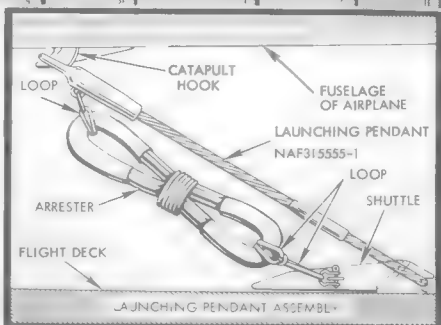
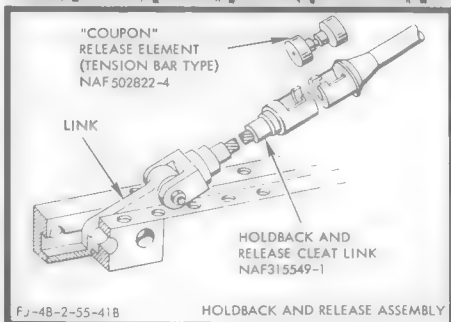
NAVAER 01-60JKE-502

Spotting and hooking up of the airplane on the carrier deck catapult gear is of utmost importance. When the airplane is approaching the catapult spot, a nose gear steering bar should be used to align the airplane. The maximum off-center alignment is plus or minus 2 inches. After the airplane has been spotted on the catapult, the pendant and

holdback assemblies are connected. Releasing of the holdback door is accomplished by pushing on the trip door, located in the center of the holdback fairing door. The holdback door can then be grasped with one hand and the unit pulled down.



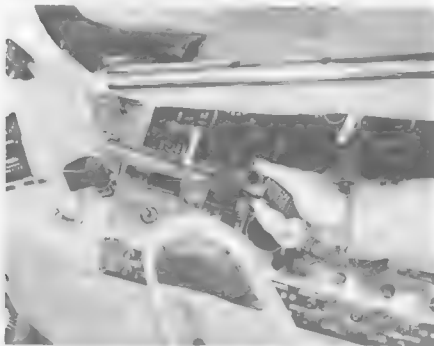
AIRPLANE SPOTTING ALLOWANCES



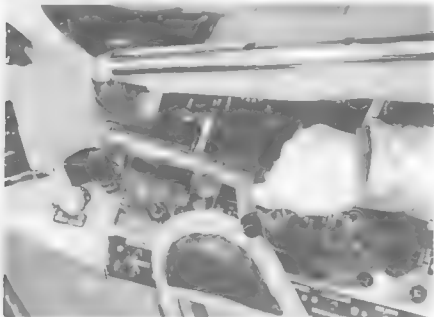
## 1-30. ARRESTING AIRPLANE.

The principal parts of the arresting gear system consist of: the arresting gear, complete with hook; control handle, including linkage; wiring; tubing and the air-oil snubber.

- 1** Extensor of the arresting gear is accomplished by pulling out the release handle as far as possible. The handle is held in this position by a ratchet.



- 2** Retracting the arresting gear is accomplished by rotating the handle approximately 90 degrees counterclockwise to disengage the ratchet.



**Caution** Do not rotate handle more than is necessary to disengage the ratchet. Excessive rotation will damage insulation wiring to the warning light in the handle.

**Warning** If it is necessary for "hookmen" to disengage the carrier deck cross deck pendant from the airplane arresting gear hook, extreme caution should be used to clear the area when the cross deck pendant is retrieved to its ready position.

**Note** The operation of the arresting gear and condition of the hook must be checked prior to each flight.

*Note*

It is not necessary to remove the arresting gear to remove the hook point. The hook point is removed by removing the bolt attaching the hook point to the arresting gear.

- Read and follow the maintenance instructions in paragraph 3-312 before performing any maintenance on hydraulic and electrical components.

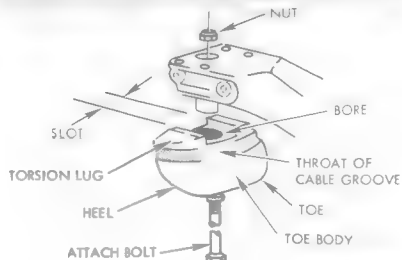
- 3** The hook point used on the arresting gear is the Colmonoy surfaced forged steel detachable type. Conditions which may warrant the replacement of the hook point may be found in paragraph 3-332.

## INSTRUCTIONS FOR INSTALLATION OF DETACHABLE HOOK POINTS.

- 1** Loose hook points increase the possibility of attaching bolt or nut failure in addition to aggravating chipping of the Colmonoy coated hook points. The following precautions shall be taken in installing the detachable hook points:

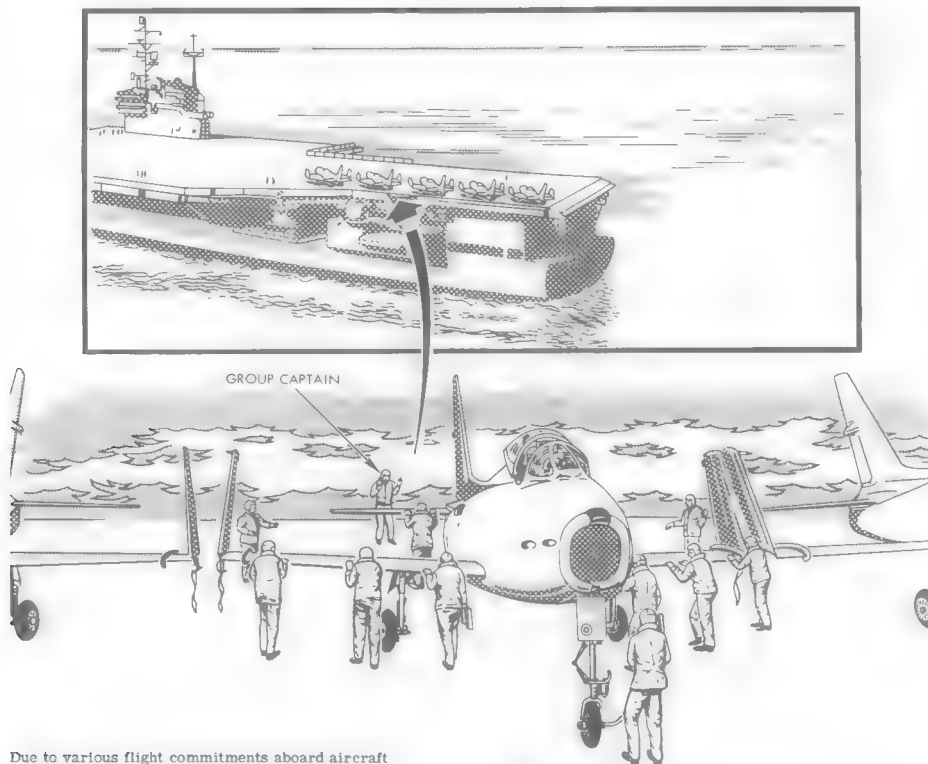
**Note** An arresting gear support assembly, P/N E2747, can be utilized for supporting the arresting gear for maintenance of the hook point.

- Use a new attaching bolt and nut each time a hook point is removed and replaced.
- Ensure that hook point attaching bolt is properly installed (i.e., the threaded end of the bolt is on top of the arresting hook shank head forging).
- Ensure that the hook point is secured tightly; on installations which utilize a fiber or nylon insert type attaching nut, replace the nut if tightening is necessary. Torque to 300 ( $\pm$  10) foot-pounds.



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1-31. DECK SPOTTING.



Due to various flight commitments aboard aircraft carriers, it is frequently common to respot the airplanes on the flight deck.

Respotting of the airplanes is normally done by the use of flight deck mules, tractors, etc. Although on occasion the airplanes have to be moved by manpower, this is accomplished by a crew of qualified "plane pushers" under the direction of a group captain. These crews usually consist of from 10 to 12 men. Two or more men are assigned to handle each wing and two or more men to the tail. The group captain usually takes his station at the tail where he can watch the signals of the flight deck plane directors.

- 1** Never move the airplane unless there is a qualified plane captain in the cockpit and all the external ground safety locks and pins are in their respective positions.
- 2** When spotting the airplane, never park less than 8 inches from any other airplane or object.

- 3** If the airplane is to be parked in a group, always fold the wings and install the jury struts.

- 4** Permissible pushing areas on the airplane are on the leading edges of the wings (if the droop leading edge is streamlined), the leading edges of the horizontal stabilizers, the landing gears, nose gear and solid parts of fuselage.

**Caution** Never push on control surfaces, speed brakes or landing flaps. These units are designed for stress in one direction only and are easily damaged.

After the airplane has been spotted, if it is to be left in this position, place chocks around both landing gear wheels, center the nose wheel, attach a low resistance ground wire between the airplane and deck and tie down as directed.

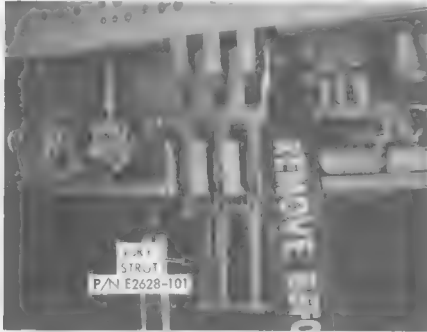
FJ-48-2-55-39



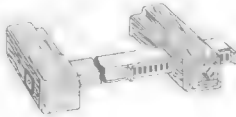
## 1-32. CARRIER DECK MOORING.

**Note** Information on the weather as to wind velocities and temperatures will be the determining factors for the aircraft handling officer to use for mooring and protective cover requirements. The equipment illustrated should be used when mooring and the steps listed will be followed for proper mooring on aircraft carriers.

- 1** Fold wings and install jury struts.

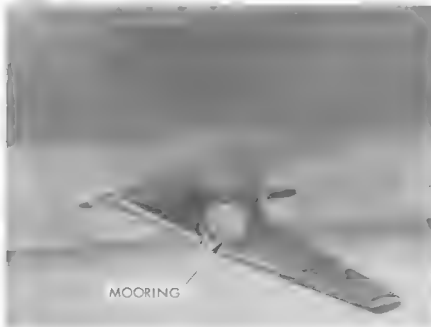


- 2** Check main landing gear wheels, center nose wheel and attach a low resistance ground wire from the airplane to the deck.



MOORING POINTS

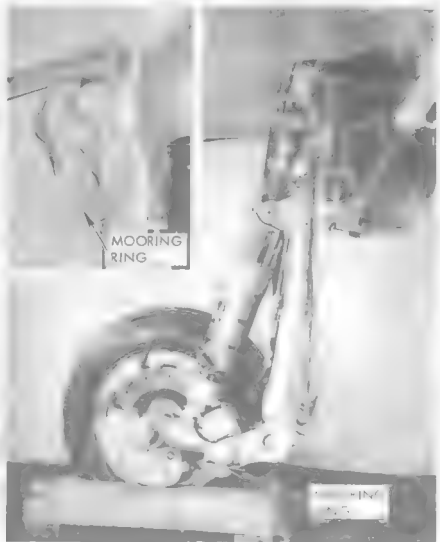
AFT FUSELAGE (One Place on Tail Bumper)



NOSE GEAR STRUT (Two Places)



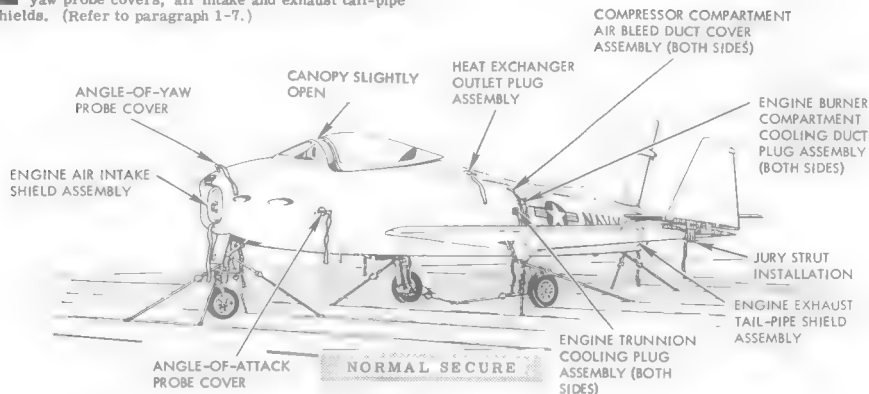
MAIN GEAR STRUT (Two Places on Each Gear)



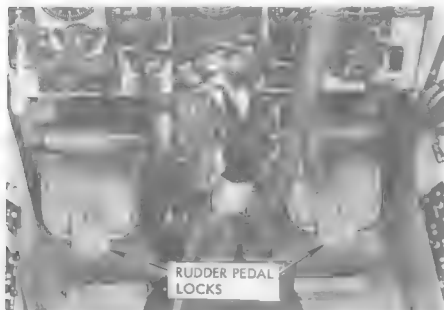
- 3** Check for installation of external ground safety locks and pins. (See figure 1-14.) Check for warning flag attachment.

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- 4** Install pitot tube cover, angle-of-attack and angle-of-yaw probe covers, air intake and exhaust tail-pipe shields. (Refer to paragraph 1-7.)

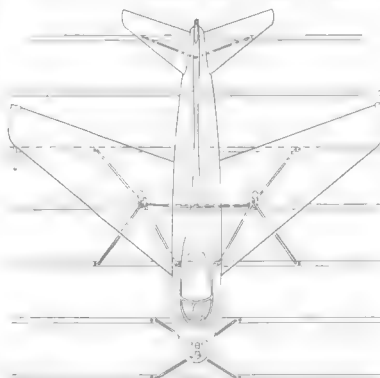
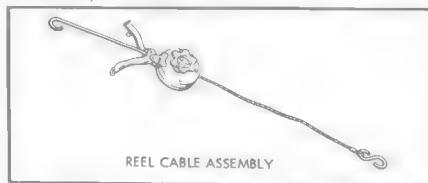


- 5** Lock the rudder pedals in the neutral position.

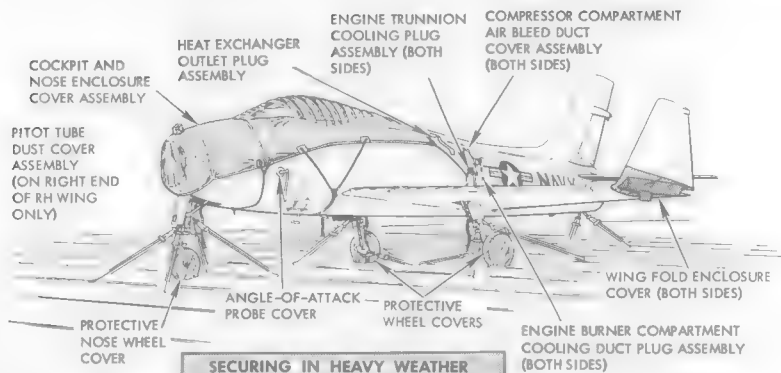


TYPICAL TIE-DOWN KNOTS UTILIZING 3/4-INCH MANILA LINES

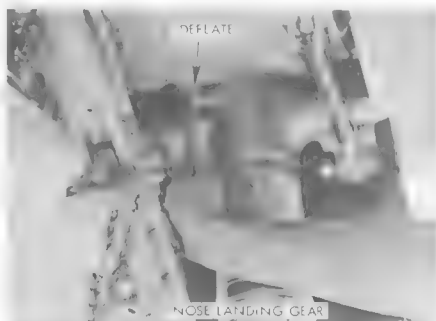
**Note** Reel cable assemblies will be used for normal secure (3/4-inch manila lines used as alternate).



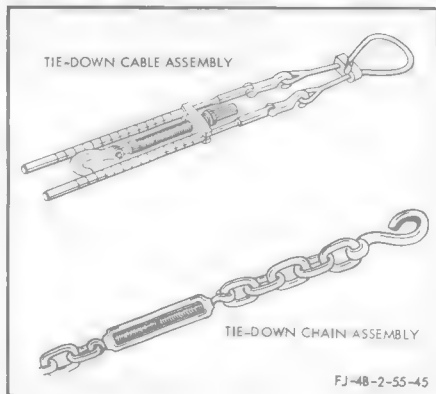
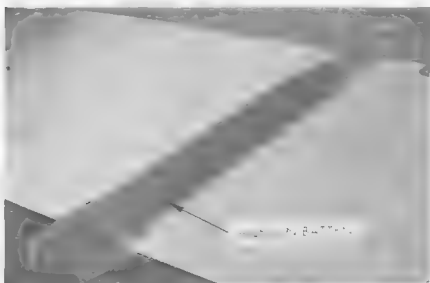
- 6** If climatic and weather conditions permit, keep the canopy slightly open. Direct sunlight and high temperatures can cause the acrylic plastic canopy to crack or craze.



- 7** For heavy weather mooring, deflate the nose and main landing gear struts.



- 8** Place all control surfaces in their retracted or streamlined position.
- 9** As climatic conditions dictate, install all protective covers as necessary.
- 10** Install aileron battens for heavy weather mooring.

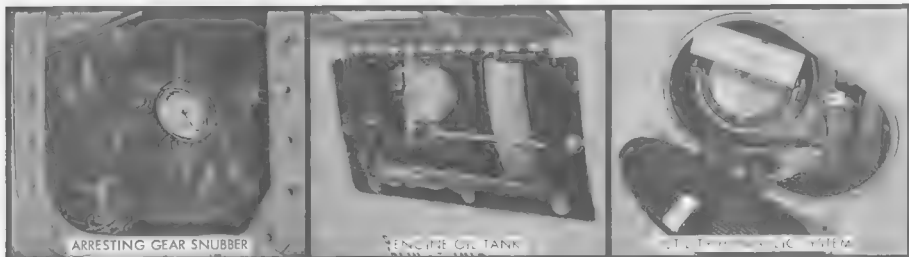


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## SERVICING

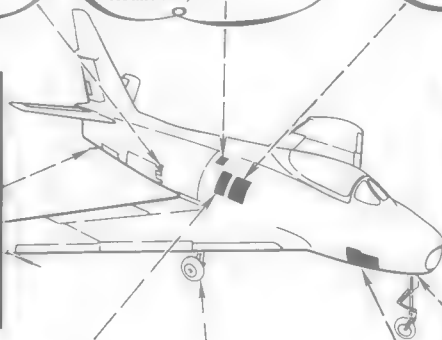
## 1-33. SERVICING.



Use hydraulic fluid (item 95, materials list). Pressure to 500 psi with arresting gear up and locked.

Fill to top of filler neck immediately after engine shut-down with oil (item 87, materials list).

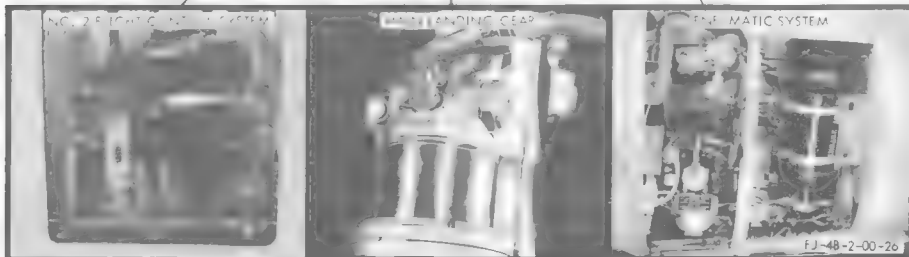
Fill reservoir to full mark on sight gage with hydraulic fluid (item 95, materials list).

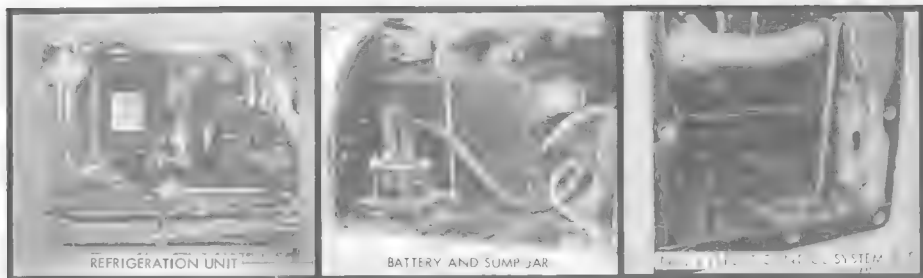


Fill system with hydraulic fluid (item 95, materials list). Check accumulator air charge 600 (+50/-0) psi.

Use hydraulic fluid (item 95, materials list). Strut extension 3-7/8 inches.

Charge air bottle to 1500 psi.

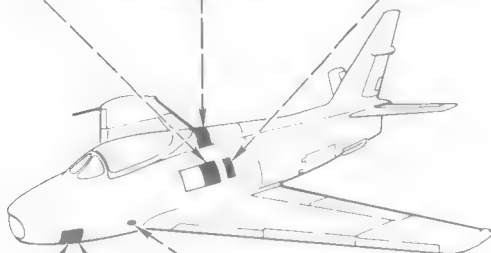




Replace cartridge  
at specified intervals.

Take hydrometer reading  
of each cell. Replace  
battery if reading is 1.240  
or below.

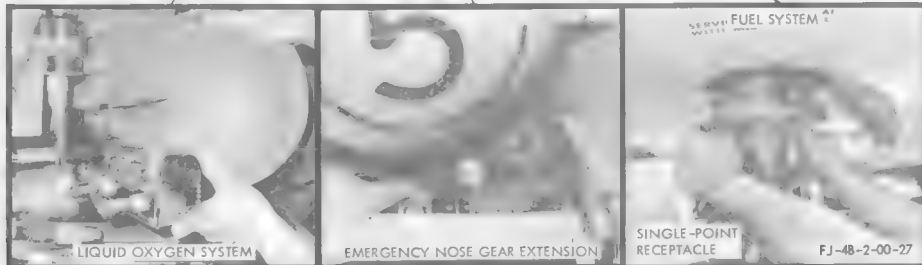
Fill system with hydraulic  
fluid (item 95, materials list).  
Check accumulator air charge  
600 (+50/-0) psi.



Liquid oxygen system capacity -  
5 liters (item 97, materials list).

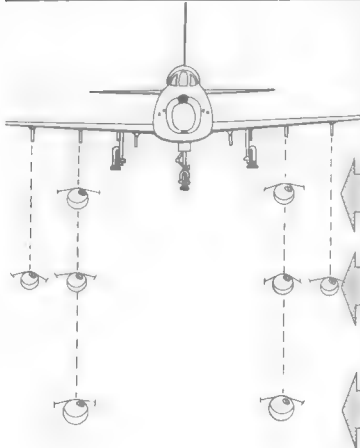
Precharge accumulator  
to a pressure of 1200 psi.

Fill to capacity with JP-4  
or JP-5 fuel (item 56, ma-  
terials list).



## 1-34. SERVICING FUEL SYSTEM.

| APPROVED FUEL |        |                       | FUEL LOADING CONDITIONS | FILLING RATE (GPM) | FILLING TIME (MINUTES) | CAPACITY |         |        |
|---------------|--------|-----------------------|-------------------------|--------------------|------------------------|----------|---------|--------|
| ASHORE        | AFLOAT | EMERGENCY FUEL        |                         |                    |                        | US GAL   | IMP GAL | LITERS |
| JP-4<br>JP-3  | JP-5   | JET MIX 2:1<br>AV GAS |                         |                    |                        |          |         |        |

|     |  |     |     |                   |                         |                           |
|-----|--|-----|-----|-------------------|-------------------------|---------------------------|
| "A" | FWD FUSELAGE CELL<br>AFT FUSELAGE CELL<br>WING TANKS LH<br>AND RH<br>TOTAL CAPACITY<br>CONDITION "A" | 168 | 5.0 | 339<br>155<br>346 | 282.8<br>129.0<br>288.1 | 1283.1<br>586.7<br>1309.6 |
| "B" | TWO 200-GAL<br>AUX TANKS<br>TOTAL CAPACITY<br>CONDITIONS "A"<br>AND "B"                              | 163 | 7.6 | 400               | 333.1                   | 1424.0                    |
| "C" | TWO 200-GAL<br>AUX TANKS<br>TWO 150-GAL<br>AUX TANKS<br>TOTAL CAPACITY<br>CONDITIONS "A"<br>AND "C"  | 179 | 8.6 | 400<br>300        | 331.1<br>249.8          | 1424.0<br>1135.5          |
| "D" | BUDDY TANKER<br>PACKAGE TOTAL<br>CAPACITY CONDI-<br>TIONS "A" AND "D"                                | 185 | 7.6 | 568               | 472.9                   | 2149.8                    |
|     |  |     |     | 1408              | 1172.4                  | 5329.3                    |

**Note** No expansion space is provided in the fuel cells. However, the auxiliary tanks have an expansion space of 3 percent.

The wing of the airplane is designed and constructed as a wet wing, whereby the skin on the inboard panel is precision machined and sealed to form the outer shell of an integral fuel cell. Refueling and defueling the system is accomplished through a single-point receptacle located on the bottom of the fuselage. (There are no provisions for gravity filling the internal fuel system.) The auxiliary fuel tanks are filled through the single-point receptacle or can be gravity filled through the filler opening provided.

*Warnings*

- Always conduct refueling and defueling operations outdoors in designated areas. Be careful to avoid spillage.
- Smoking or other sources of ignition are prohibited within 100 feet of the airplane (with the exception of approved fireproof refueling units).
- Be sure that the airplane and the servicing equipment are properly grounded.
- No fueling operations will be done if radio or radar equipment is operating within a 150-foot radius.
- Provide proper fire fighting equipment manned by competent personnel.
- Fueling unit operators should park the fueling units or vehicles so that the driver's side of the vehicle is closest to the airplane. The door on the driver's side of the vehicle should be open at all times during fueling operations.
- Do not refuel or conduct any servicing operations using combustible materials while the oxygen system is being recharged.
- When using an approved auxiliary power unit for servicing the airplane, it should be parked downwind as far from the airplane as the power cable will allow.
- No maintenance should be allowed during fueling operations.

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## REFUELING

- 1** Ground airplane and refueling unit as shown. Make sure ground contacts are clean.
- 2** Check cockpit and ascertain that all switches are in the "OFF" position.



- 3** If for any reason the circuit breakers on the left-hand radio bay circuit-breaker panel have been pulled out, they must be re-checked and, if necessary, reset.



- 4** Connect the external power unit to the 28-volt d-c external power receptacle (oval-shaped).



**Caution** The d-c power switch must be in the "OFF" position any time an external source of d-c power is being used.

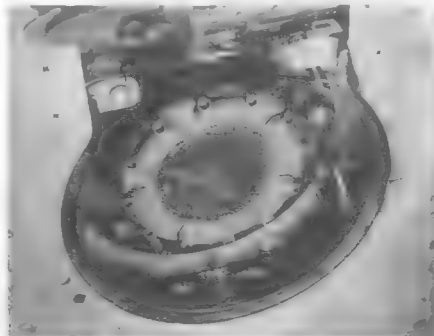
- 5** Remove refueling receptacle cap. Ground refueling nozzle to airplane and insert nozzle into receptacle by pushing up and turning clockwise to a locked position.



- 6** Start ground servicing equipment.

**Caution** The pressure must not exceed 70 psi at flow rates from 0 to 170 gpm and 50 psi at flow rates in excess of 170 gpm. Excess pressure may cause the shutoff valve in the sump tank to close too slowly with resultant overflow.

- 7** Test the fuel level control valve or valves during the first minute of the refueling operation by actuating the test switch or switches located in the single-point refueling receptacle well. (For detailed information regarding this procedure, refer to paragraph 4-216 and the decal located on the inside of the fuel receptacle access door.) If there is a vibration or throbbing noise at the fuel nozzle soon after the test switch is actuated, or if the gage on the refueling unit indicates no fuel flow, the fuel level control valves are closing properly.



**Caution** To prevent damage to the fuel cells if the fuel level control valves become inoperative, stop refueling, locate source of trouble and correct. (Refer to paragraph 4-155.)

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## 1-35. DRAINING FUEL SYSTEM.

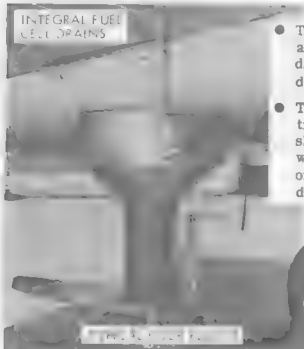
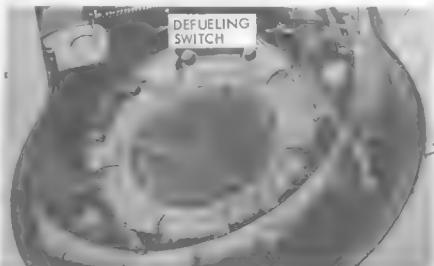
## SINGLE-POINT DEFUELING

**1** To defuel the airplane, the fuel nozzle is inserted into the receptacle and locked as in single-point refueling.

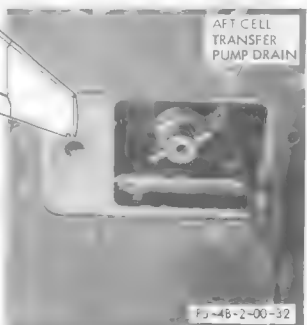
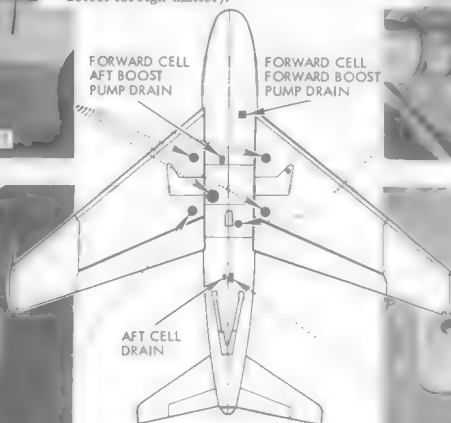
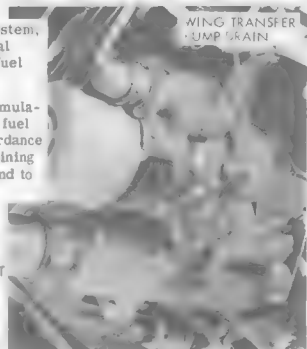
**Caution** Be certain the airplane is grounded as shown in paragraph 1-35.

**Caution** During defueling operations when the defuel switch is in the "ON" position, the ENGINE MASTER switch must be kept in the "OFF" position.

**2** With external power connected, place the defueling switch in the "DEFUEL" position. The switch is located inside the receptacle access door and is mounted so that the receptacle door cannot be closed without turning the switch to the "OFF" position.



- Note**
- To ensure complete drainage of the fuel system, after single-point defueling, each individual drain should be opened and the remaining fuel drained in a suitable container.
  - To eliminate water or foreign matter accumulation in the fuel system, a small amount of fuel should be drained from each drain in accordance with Technical Order No. 49-54 (daily draining of aircraft fuel systems to remove water and to detect foreign matter).



**Warning** Adequate fire fighting equipment must be available during defueling operations and all safety rules and regulations observed.

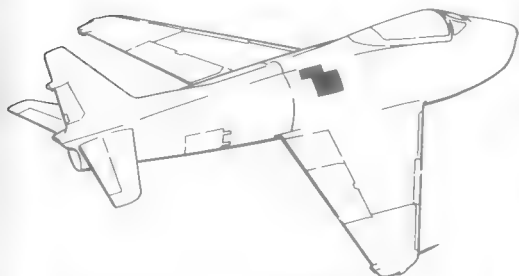
FD-46-2-00-32

1-36. SERVICING AND DRAINING OIL SYSTEM.

**3** Wipe up any spilled oil and replace cap.

**4** When the cap is fully tightened, the oil cap safety indicator will retract, permitting access door to be closed.

**Caution** Do not stand on the wing flap to reach the oil filler cap. Use a stand or a ladder.



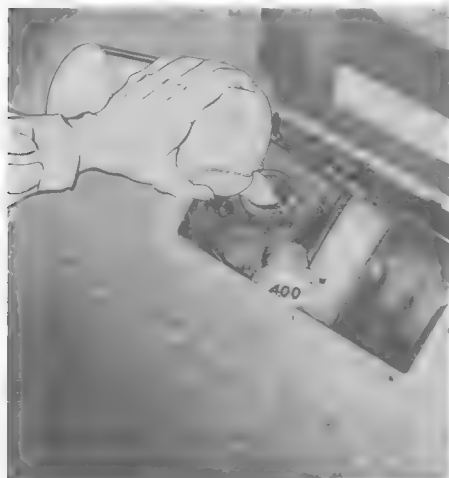
SERVICING THE OIL SYSTEM

**Warning** Fill the oil tank immediately after engine shutdown. If filling is delayed, oil from the tank will flow to the engine and cause an overfull system.

**1** Open access door on right-hand side of airplane just forward of fuselage break and remove cap from oil tank.

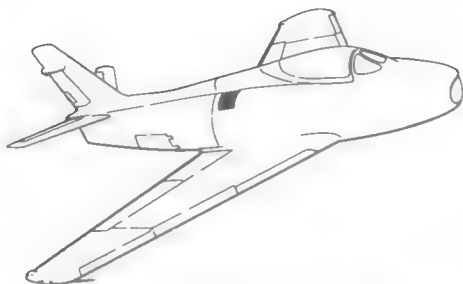
**Caution** Do not use corrosion-preventive oil (item 42, materials list) for flight. Maximum use for ground operation is 5 hours.

**2** Fill tank until oil level reaches top of filler neck.

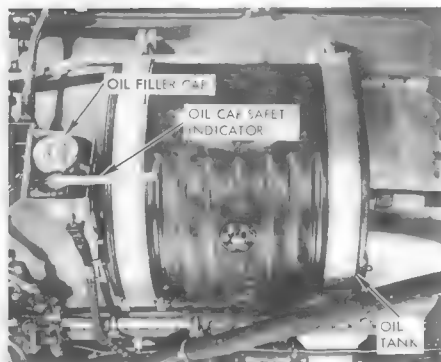


| OIL<br>ITEM 87, MATERIALS LIST                |             |              |              |               |
|---|-------------|--------------|--------------|---------------|
| 4-GALLON OIL TANK                             | US<br>GAL   | US<br>QTS    | IMP<br>GAL   | LITERS        |
| OIL LEVEL - FULL<br>SUMP CAPACITY (NONUSABLE) | 4.4<br>0.05 | 17.6<br>0.20 | 3.66<br>0.04 | 16.65<br>0.19 |
| EXPANSION SPACE                               | 1.2         | 4.8          | 1.0          | 4.54          |
| TOTAL CAPACITY                                | 5.6         | 22.4         | 4.66         | 21.19         |

**Note** The maximum oil consumption rate for the J65-W-4B/16A engine is 0.4 gallon per hour.



3-GALLON OIL TANK



| OIL<br>(ITEM 87, MATERIALS LIST)              |           |           |            |        |
|---|-----------|-----------|------------|--------|
| 3-GALLON OIL TANK                             | US<br>GAL | US<br>QTS | IMP<br>GAL | LITERS |
| OIL LEVEL - FULL<br>SUMP CAPACITY (NONUSABLE) | 3.0       | 12.0      | 2.50       | 11.35  |
|   | 0.12      | 0.48      | 0.10       | 0.45   |
| EXPANSION SPACE                               | 1.40      | 5.60      | 1.16       | 5.30   |
| TOTAL CAPACITY                                | 4.40      | 17.60     | 3.66       | 16.65  |

*Caution*

- If the oil system becomes contaminated with fuel, the source of fuel leakage must be determined and corrected and the oil system flushed and refilled with specified oil.
- If the oil system becomes contaminated with hydraulic oil, the engine must be returned to overhaul, since hydraulic oil causes deterioration of the oil system seals.
- No preheating or oil dilution is required unless temperatures drop below  $-26^{\circ}\text{C}$  ( $-15^{\circ}\text{F}$ ). If preheating becomes necessary, proper engine oil pressure will be obtained by preheating both the oil tank and oil pump an equal amount of time.

## DRAINING THE OIL SYSTEM

- 1 Obtain suitable container to catch oil.
- 2 Open access door on bottom of fuselage.
- 3 Open drain valve on oil pump inlet and allow oil to drain into container.



*Note* A separate drain line is located on the tank itself for draining the oil tank sump. An additional oil drain is also provided on the accessory gear box.

# 1-37. SERVICING LIQUID OXYGEN SYSTEM.

| LIQUID OXYGEN DATA                          |   |
|---|---|
| OXYGEN                                      | (ITEM 97, MATERIALS LIST)<br>GRADE B, TYPE II |
| SYSTEM CAPACITY                             | 5 LITERS                                      |
| SYSTEM PRESSURE                             | 70 PSI  |
| COLOR CODE FOR<br>OXYGEN DISTRIBUTION LINES | GREEN   |

## CONTAINER

The liquid oxygen container is a double-walled, vacuum insulated unit having a capacity of 5 liters. The container disconnect panel contains the ground filler valve, two electrical quick-disconnects and two oxygen quick-disconnect couplings.

## PRESSURE OPERATED CONTROL VALVE

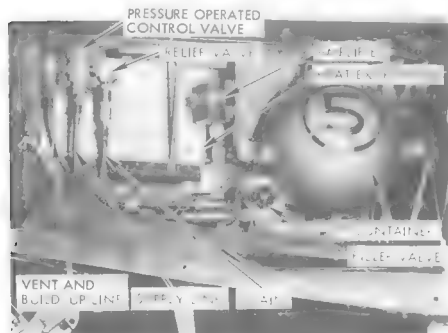
The function of this valve is to control system pressure. If system pressure falls below 65 psi, the pressure operated control valve opens and allows oxygen from the supply line to enter the system; thus pressure is increased to 70 psi by the evaporation of the additional liquid oxygen.

## HEAT EXCHANGER

The heat exchanger is placed in the system to raise the temperature of the evaporated liquid oxygen to ensure that the pilot will suffer no ill effects due to the consumption of oxygen at extreme temperatures.



## DESCRIPTION OF LIQUID OXYGEN SYSTEM



## RELIEF VALVE

If system pressure becomes excessive, the relief valve has a cracking pressure of 100 psi and a full flow pressure of 120 psi. Approximately one liter of liquid oxygen will be lost overboard through this valve during a 24-hour period when the system is not in use.

The pilot's breathing oxygen system used on the airplane is a low-pressure system. It provides gaseous oxygen to the diluter-demand regulator at a pressure of 70 psig and delivery rates up to 20 liters per minute as demanded by the pilot. The normal delivery rate of the system is 10 liters per minute. The gaseous oxygen supply is maintained by means of a liquid oxygen conversion system. This conversion system maintains the delivery pressure and volume by controlled evaporation of the liquid oxygen, which is stored in the 5-liter, vacuum-insulated storage container. The amount of liquid permitted to be evaporated to maintain system pressure is controlled by means of a pressure-operated control valve. After evaporation, the oxygen is passed through a heat exchanger to raise its temperature and is then delivered to the diluter-demand regulator for pilot consumption. A system relief valve is provided to vent excessive pressures overboard that may occur due to the boil-off of the liquid oxygen. An electrical capacitance-type gaging system is an integral part of the system to provide the pilot with an accurate means of determining the amount of liquid oxygen remaining at any time.

FJ-4B-2-00-36A

Revised 1 May 1958



### PHYSICAL CHARACTERISTICS OF LIQUID OXYGEN

Liquid oxygen is pale blue in color, flows like water and weighs 9.54 pounds per gallon. It is extremely cold, boiling into gaseous oxygen at atmospheric pressure at a temperature of -297°F. The liquid has a volume expansion ratio of 862 to 1, which means that a volume of liquid will expand 862 times when converted to a gas at atmospheric pressure. It has a density of 1.14 grams per cubic centimeter and its latent heat of vaporization is 50.9 calories per gram.

### Warning

Never get carried away with your work. Like some other aircraft systems, the oxygen system can be dangerous and must be respected, but once understood, certainly not feared. Personnel designated to service the system must be thoroughly familiar with liquid oxygen properties and skilled in its use. The following precautions must be adhered to when handling liquid oxygen.

### SAFETY PRECAUTIONS

Never store or handle oxygen in a poorly ventilated area or close to combustible materials such as fuels and lubricants. Organic materials including clothing and cigarettes when brought into contact with liquid oxygen will burn violently if ignited within several minutes after exposure.

Smoking, open flames, sparks, burners, heaters and exhausts must be kept away from storage vessels, portable units and the airplane while the oxygen is being transferred. Tools and clothing must be free of oil and grease.

Use only equipment which is furnished for handling oxygen; do not substitute. The composition of many materials is quite different at -297°F than it is when at room

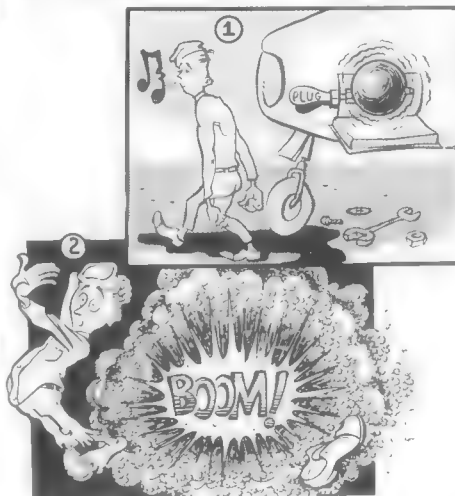
temperature. Rubber shatters like glass and metals get brittle and lose their strength, etc.

Protective equipment consisting of a suitable face shield, apron and gloves must be worn when handling liquid oxygen. If it accidentally comes into contact with personal clothing, the clothing should be removed immediately. In case of body contact or if there is reason to suspect that a part of the body has been frozen or chilled, seek medical help immediately. Do not touch any of the oxygen system metal lines with bare hands, as the skin will freeze instantly.

When transferring liquid oxygen, ensure adequate ventilation by opening all available ports and hatches. Never use, or attempt to use, 1800 psi gaseous oxygen transfer equipment to transfer liquid oxygen, or vice versa. Never use oxygen equipment to store or transfer any other gas or liquid.

When a completely empty system is serviced, the oxygen must be added slowly to cool the system equipment down to the -297°F storage temperature. The equipment may be damaged by thermal shock or excess pressure if the oxygen is forced in too rapidly.

Safety precautions cannot be overemphasized when personnel and property are involved. As a further reminder when recharging an aircraft oxygen system, ensure that the aircraft is in an open area, is not being fueled, is properly grounded and has no internal or external power on. Also ensure that fire extinguishing equipment is readily available, that personnel are clear of vent area and that the immediate vicinity of the vent area is free from grease, oil or any combustible material.



### Caution

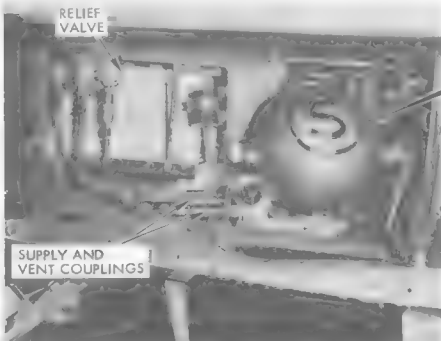
Never seal oxygen in an unvented container. Liquid oxygen sealed off at room temperature can develop a pressure of more than 12,000 psi.

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FILLING LIQUID OXYGEN SYSTEM (TRAILER METHOD)

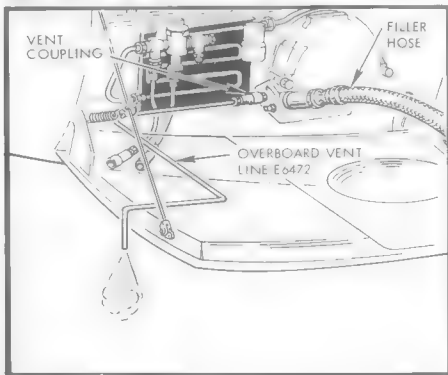
**Caution** The liquid oxygen system must be purged if it has remained empty for several hours or has been open to atmosphere due to parts replacement without capping or plugging all openings. (Refer to paragraph 4-123)

**1** After filler cart has been positioned near airplane, open access door and uncouple both the supply and vent quick-disconnect couplings from the container.



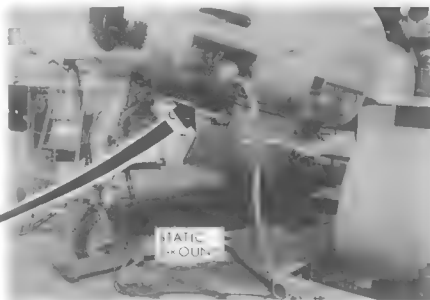
**2** Connect overboard vent line E6472 to the vent quick-disconnect on the container.

**3** Provide suitable overflow receiver under the overboard vent line.

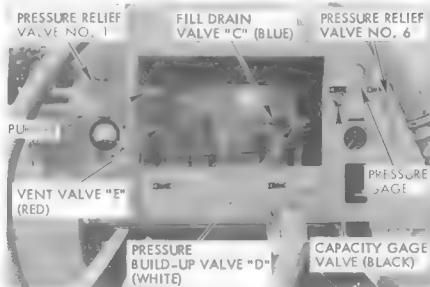


**4** Connect static ground from trailer to airplane and airplane to deck.

**Note** The following instructions apply to the Ronan and Kunzl Model 50 portable liquid oxygen servicing container. Instructions for servicing the airplane from a liquid oxygen trailer may vary according to the manufacturer of the trailer.



**5** Prepare trailer for servicing as follows:



- A. Close vent valve "E" (red) creating a pressure within the servicing container. Closure of the valve also prevents the escape of gaseous oxygen from the servicing container.
- B. Open capacity gage valve (black) to permit an indication of the quantity of liquid oxygen in the servicing container.
- C. Check relief valves No. 1 and No. 6 for operation. Correct operation ensures safety against excessive oxygen pressure within the lines.
- D. Slowly open pressure build-up valve "D" (white), letting a small amount of liquid into the build-up coil. This valve controls the flow of liquid into the build-up line where the liquid evaporates and passes to the inner vessel, providing an operational pressure for liquid oxygen transfer.
- E. Allow pressure to build up from 20 to 30 psi and then close valve "D" before reaching 30 psi since pressure will continue to increase slightly after valve is closed. A higher build-up (above 30 psi) will result in a higher final pressure, necessitating pressure relief.

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- G. Thrust the outlet end of the hose into the purging body and purge the trailer supply for a minimum of 2 minutes. This should include a liquid flow of at least 10 seconds.



**Note** The delivery hose must be purged immediately before servicing each airplane.

**Note** To eliminate the possibility of servicing airplanes with contaminated oxygen, a "sniff" test should be performed on the liquid oxygen delivery hose after the hose is purged. The test consists of allowing the liquid oxygen to evaporate from the filler receptacle and frequent smelling of the filler receptacle until, and after, the accumulated frost on the outside of the filler hose has completely melted. If any odor is detected, follow the instructions as outlined in BuAer AC & SE Bulletin No. 7-57.

- H. Close fill drain valve "C" (blue).

- 6** Connect delivery hose to airplane filler valve.

- 7** Slowly open fill drain valve "C" (blue).

**Caution** All valves controlling the flow of oxygen should always be opened slowly to prevent sudden thermal shock to metal parts and to prevent rapid pressure increases due to rapid evaporation.

- 8** Completely fill oxygen container. The first amount of liquid oxygen (one to two liters) to flow into the container will be evaporated in cooling down the container and will produce a great amount of cold gaseous oxygen flowing out the overboard vent. When this flow of gaseous oxygen slows down, liquid is entering the container. The container is considered full when a steady stream of liquid spills out the overboard vent.

- 9** When container is full, immediately close fill drain valve "C" (blue), disconnect delivery hose from filler valve, release pressure in hose by relieving valve No. 6 and return hose to rack on top of trailer.

**Note** Always replace cover on delivery hose nozzle when not in use.

- 10** Replace cover on airplane filler valve.

- 11** Disconnect overboard vent line from container. Connect supply and vent quick-disconnect couplings to the container and close oxygen access door.

- 12** Secure servicing equipment as follows:

- A. Remove overflow receiver from under the overboard vent. Should any oxygen still be in the overflow receiver, allow it to remain there until evaporated.
- B. If there are other airplanes to be serviced, the trailer tank may remain pressurized. The pressure can be controlled by momentarily opening pressure build-up valve "D" (white) to increase pressure or open relief valve No. 1 to decrease pressure.
- C. If there are no other airplanes to be serviced, valves "C" and "D" should be closed and vent valve "E" (red) should be opened just enough to maintain the tank at atmospheric pressure ("0" on the gage).



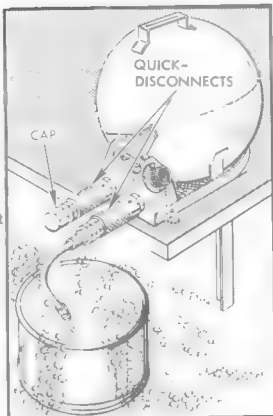
**Warning** Protective gloves and clothing should be worn, as liquid oxygen will burn severely if spilled on personnel.

**Note** If additional operating information is required for the servicing trailer, refer to the Operating, Service & Repair Instructions for Liquid Oxygen Servicing Trailer LOX50-3 (NAVAER 19-25D-501).

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**Note** If it is necessary to drain the container, proceed as follows:

- 1** Open oxygen access door.
- 2** Remove portable container from airplane by following steps 1 through 3 above.
- 3** Connect a quick-disconnect coupling (same as supply line quick-disconnect coupling) to the supply port on the container.
- 4** Provide a suitable receptacle (free of contaminants) under the quick-disconnect coupling on the supply port.
- 5** Cap vent port on container. This allows container to become pressurized and oxygen will flow through the supply port into the receptacle.



**Warning** Make sure supply port is open to allow oxygen to flow into container before capping vent port. Never cap vent port before connecting quick-disconnect coupling to supply port. Remove cap on vent port when draining is completed. Follow all safety precautions on sheet 2.

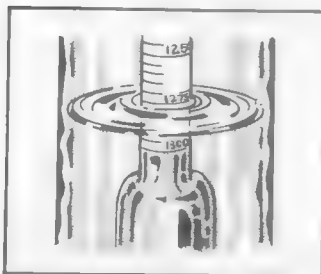
**Note**

- Allow approximately 5 minutes for container to drain.
- If necessary, a slight positive pressure of gaseous oxygen may be applied at the vent port to speed draining operation.
- An alternate method of draining the container if quick-disconnect coupling is not available is by attaching a delivery hose adapter to the filler valve and draining the oxygen by pressurizing the container.

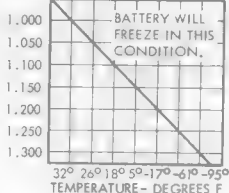
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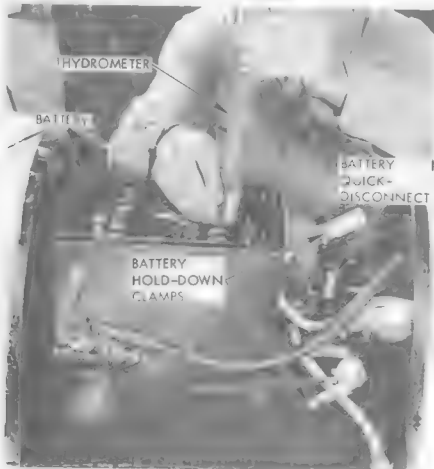
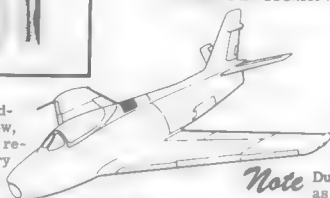
## 1-38. SERVICING BATTERY AND SUMP JAR.



BATTERY FREEZING POINTS



**Note** If specific gravity readings are 1.240 or below, the battery must be replaced or recharged. A fully charged battery should read between 1.275 and 1.300.



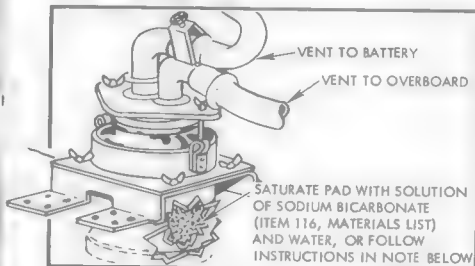
## SERVICING BATTERY

- 1 Remove battery access cover on top of fuselage at aft end of canopy.
- 2 Release battery hold-down clamps and remove cover from battery.
- 3 Take hydrometer reading of the fluid in each cell to determine condition of battery.
- 4 If specific gravity is satisfactory, add distilled water to each cell as necessary, being careful not to overfill. The correct level of the fluid is 3/8 inch above the plate and separator protector.

| TABLE OF TEMPERATURE CORRECTIONS |                                    |
|----------------------------------|------------------------------------|
| ELECTROLYTE TEMPERATURE (°F)     | SPECIFIC GRAVITY CORRECTION POINTS |
| 140                              | 0.024                              |
| 130                              | 0.020                              |
| 120                              | 0.016                              |
| 110                              | 0.012                              |
| 100                              | 0.008                              |
| 90                               | NO COR REQD                        |
| 80                               | NO COR REQD                        |
| 70                               | NO COR REQD                        |
| 60                               | -0.008                             |
| 50                               | -0.012                             |
| 40                               | -0.016                             |
| 30                               | -0.020                             |
| 20                               | -0.024                             |
| 10                               | -0.028                             |
| 00                               | -0.032                             |
| 10                               | -0.036                             |
| 20                               | -0.040                             |
| 30                               | -0.044                             |

**Note** Temperature corrections must be made to ensure accurate readings.

**Note** During cold weather, the battery must be kept as near fully charged as possible; otherwise the fluid will freeze. The battery should be removed and stored in a warm place when the airplane is to be parked for more than 4 hours at temperatures below -20°F or for an extended period.



## SERVICING SUMP JAR

- 1 Remove the two wing nuts that hold the cover to the container. Remove jar from container.
  - 2 Pour off any liquid. Check the chemical condition of the sponge with blue litmus paper.
- Note** Touch moistened blue litmus paper to sponge. If the paper turns red, it is then necessary to reactivate the sponge by thorough washing and drying, and then immersing the sponge in a saturated solution of trisodium phosphate (item 135, materials list) and boiling water. Allow sponge to cool before replacing it in jar.
- 3 Reinstall jar.

**Warning** Electrolyte in lead-acid batteries is made of one part chemically pure sulphuric acid and three parts water by volume. Be careful not to spill on body, clothing or equipment. If this does occur, immediately neutralize the affected area with a solution of sodium bicarbonate (item 116, materials list).

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# 1-39. SERVICING UNITS EQUIPPED WITH HIGH-PRESSURE AIR VALVES.

## DISCHARGING AIR AND REMOVING AIR VALVE

- 1** Remove valve cap.
- 2** With a wrench, check that 5/8-inch hex swivel nut is securely tightened.

**Warning** When the 5/8-inch hex swivel nut is loose, the positive valve seat at the bottom of the unit is open, subjecting the valve core to pressure. Under such a condition, the valve core can be blown out when being removed causing serious damage.

- 3** Check for air pressure by depressing valve core with valve repair tool (S/N R8V2200).

**Warning** Do not use match-stick type tool or stand in line with the valve body as the valve core may blow out causing serious injury.

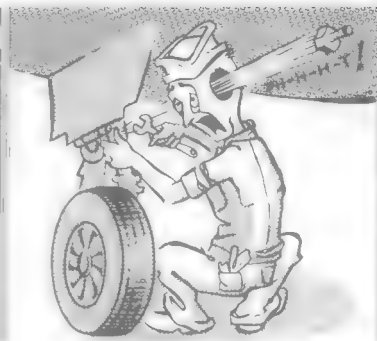
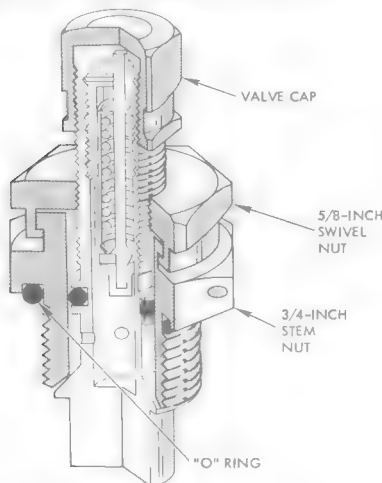
- 4** If no air pressure is present, the valve core should be removed from the stem with the same tool.

**5** Back off the 5/8-inch hex swivel nut up to a maximum of 1-1/2 turns and allow the air to exhaust. The amount the 5/8-inch hex swivel nut is loosened will govern the rate of discharge of the air.

**Warning** The 3/4-inch hex nut, if not safety-wired to the unit, should be held securely with a wrench while loosening the 5/8-inch hex swivel nut.

**Warning** Excessive loosening of the 5/8-inch hex swivel nut will result in the valve core housing dropping into the unit to which the valve is attached.

- 6** Cut safety wire and remove air valve assembly by turning 3/4-inch hex counterclockwise.



**Warning** Do not loosen valve body (3/4 inch hex nut) while unit is charged with air pressure. This could result in the valve body being blown out resulting in injury to personnel.

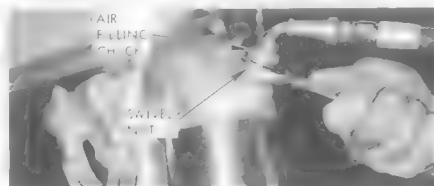
## INSTALLING AIR VALVE AND CHARGING WITH AIR

- 1** Lubricate an unused "O" ring with hydraulic oil (item 86, materials list) prior to installation in boss.

**Caution** Never install a previously used "O" ring.

**Caution** The air valve should not be used in any boss having a diameter of less than 13/16 inch.

- 2** Install air valve in boss. Bottom 3/4-inch hex valve stem assembly against the top surface.



- 3** Safety-wire air valve assembly to unit, using holes provided in 3/4-inch hex nut.

- 4** Attach air filling chuck to valve core housing.

- 5** Loosen 5/8-inch swivel nut a maximum of 1-1/2 turns.

**Warning** Excessive loosening will result in the valve core housing dropping into the unit to which the valve is attached.

- 6** Charge to proper air pressure as specified in applicable service instructions for the unit involved.

- 7** Tighten 5/8-inch hex swivel nut from 50 to 70 inch-pounds torque.

- 8** Remove air filling chuck from valve. Replace and tighten valve cap to finger-tightness.

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## 1-40. ACCUMULATOR AIR PRESSURE VARIATION WITH TEMPERATURE.

Improperly serviced accumulators may give the impression that they are leaking. To avoid replacing serviceable accumulators, the following precautions should be taken:

**1** Make sure all hydraulic pressure is bled off prior to filling accumulator with air. If this is not done, a false reading will result.

**2** Another item to consider is the air gage. If there is doubt of its accuracy, it should be removed and calibrated or replaced.

**3** A temperature versus pressure chart should be used to properly service the accumulators with air.



The following is an example of how to use chart: On a typical day, the specified accumulator precharge for the flight control system accumulator would be 800 psi. But, if the temperature at the accumulator were 120°F, it should be charged to 855 psi.

|   |     |     |     |      |      |
|---|-----|-----|-----|------|------|
| SPECIFIED ACCUMULATOR<br>PRECHARGE (PSI) →<br><br>TEMPERATURE (DEGREES F) | 120 | 550 | 655 | 1320 | 1655 |
|   | 110 | 540 | 645 | 1300 | 1625 |
|   | 100 | 530 | 635 | 1275 | 1590 |
|   | 90  | 520 | 625 | 1250 | 1560 |
|   | 80  | 510 | 610 | 1225 | 1530 |
|   | 70  | 500 | 600 | 1200 | 1500 |
|   | 60  | 485 | 590 | 1175 | 1470 |
|   | 50  | 480 | 580 | 1150 | 1440 |
|   | 40  | 470 | 565 | 1130 | 1410 |
|   | 30  | 460 | 555 | 1105 | 1380 |
|   | 20  | 450 | 545 | 1080 | 1350 |
|   | 10  | 440 | 530 | 1055 | 1315 |
|   | 0   | 430 | 520 | 1025 | 1285 |
|   | -10 | 420 | 510 | 1015 | 1255 |
|   | -20 | 415 | 495 | 980  | 1225 |

↑  
ARRESTING  
GEAR  
SNUBBER

↑  
FLIGHT  
CONTROL  
NO. 1 AND  
NO. 2 SYSTEM  
ACCUMULATORS

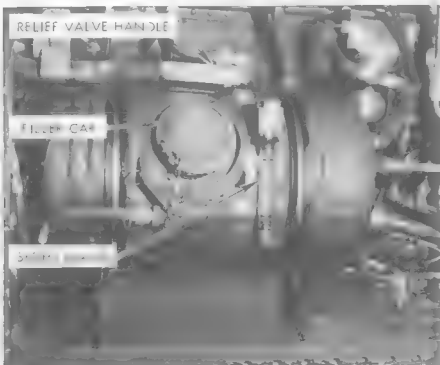
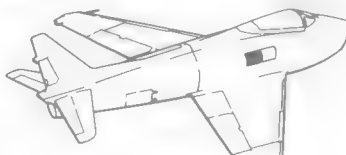
↑  
NOSE GEAR  
EXTENSION  
ACCUMULATOR

↑  
PNEUMATIC  
SYSTEM  
AIR BOTTLE

# 1-41. SERVICING UTILITY HYDRAULIC SYSTEM.

| HYDRAULIC FLUID<br>(ITEM 95, MATERIALS LIST) |       |        |        |         |        |
|--|-------|--------|--------|---------|--------|
|  | CU IN | US GAL | US QTS | IMP GAL | LITERS |
| UTILITY SYSTEM RESERVOIR                     | 622   | 2.7    | 10.8   | 2.25    | 10.22  |
| COMPLETE UTILITY SYSTEM                      | 1524  | 6.6    | 26.4   | 5.50    | 24.98  |

**Note** An alternate method of filling the utility hydraulic system is through the ground test stand pressure connection.



## FILLING UTILITY RESERVOIR

**1** With the landing gear down, landing gear doors closed, gun bay purge doors closed, speed brakes closed, wings folded, arresting hook up, emergency nose gear extension accumulator discharged and source of pressurizing air shut off, remove filler cap from the utility reservoir.

**Note** Before removing the filler cap, depressurize the reservoir by operating (raising) the air pressure manual relief valve handle.



**2** Fill the reservoir to full mark on the sight gage from a fluid container. Space is provided to adequately fill the reservoir from one-gallon containers.



**3** Replace filler cap and allow the air pressure manual relief valve handle to return to its normal position.



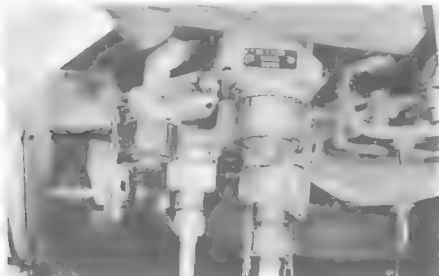
FJ-48-2-00-43

**INITIAL FILLING OF UTILITY HYDRAULIC SYSTEM**

Place airplane on jacks to permit operation of all systems and proceed as follows:

**Note** This procedure applies only to filling a complete system.

- 1 Connect hydraulic test stand lines to quick-disconnect couplings as shown below. Test stand connections are accessible through the lower engine access door.



- 2 Remove reservoir filler cap.

**Caution** Fluid level in reservoir should be at the full mark.

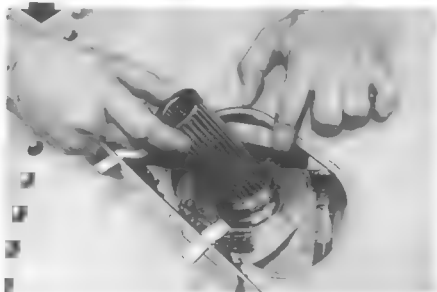
**Note** Filling and operating instructions for hydraulic ground test stands will be found with test stand information on each particular test stand.

- 3 With external electrical power connected and reservoir filled to proper level, thoroughly circulate fluid through system and operate each unit ten times in order to ensure filtration of hydraulic fluid and to transfer trapped air from the system into the air separator of the reservoir.

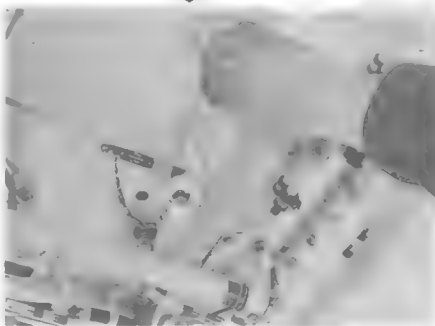
- 4 Refill utility reservoir to "FULL" mark on sight gage.

- 5 Disconnect test stand. Make sure landing gear is down and locked before lowering airplane from jacks.

The reservoir filter element in the filler neck is removable without removing the reservoir.

**DRAINING UTILITY SYSTEM**

- 1 The first step in draining or servicing the utility reservoir, the entire system, or any part of the system, is to depressurize the reservoir by operating the reservoir relief valve and removing the reservoir filler cap. After depressurization, the reservoir may be drained by removing the cap from the drain line located in the right-hand wheel well.



- 2 In order to drain other parts of the system or the entire system, disconnect lines at several low points in the system.

**Note** Before disconnecting any lines in the emergency nose gear system, the accumulator pressure should be discharged by operating the manual dump valve.

FJ-48-2-00-44A

# 1-42. SERVICING NO. 1 AND NO. 2 FLIGHT CONTROL HYDRAULIC SYSTEMS.

| HYDRAULIC FLUID<br>(ITEM 95, MATERIALS LIST)                                | CU<br>IN | US<br>GAL | US<br>QT | IMP<br>GAL | LITERS |
|---|----------|-----------|----------|------------|--------|
| RESERVOIR (TYPICAL NO. 1<br>AND NO. 2 FLIGHT CON-<br>TROL HYDRAULIC SYSTEM) | 75       | 0.325     | 1.30     | 0.27       | 1.23   |
| COMPLETE NO. 1 FLIGHT<br>CONTROL HYDRAULIC<br>SYSTEM                        | 475      | 2.05      | 8.20     | 1.70       | 7.76   |
| COMPLETE NO. 2 FLIGHT<br>CONTROL HYDRAULIC<br>SYSTEM                        | 510      | 2.20      | 8.80     | 1.83       | 8.33   |

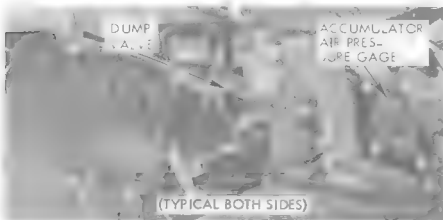
## SERVICING FLIGHT CONTROL HYDRAULIC SYSTEM RESERVOIR.

**Note** The procedures for servicing the No. 1 and No. 2 flight control hydraulic systems are identical except for location of units.

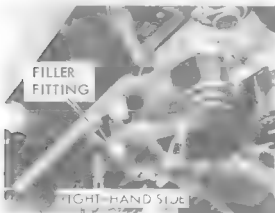
**1** Discharge the accumulator hydraulic pressure by operating the dump valve (accessible through the lower engine access door).

**2** Check accumulator air pressure gage for correct reading of 600 (+50/-0) psi.

**Note** Tap gage lightly after operating dump valve to eliminate the friction error which could cause erroneous reading.

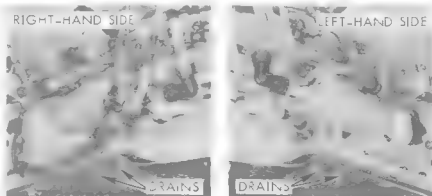


**3** Connect a hand pump and a clean source of fluid (hydro buggy) to the filler fitting on the ground test connection panel in the lower engine access bay.



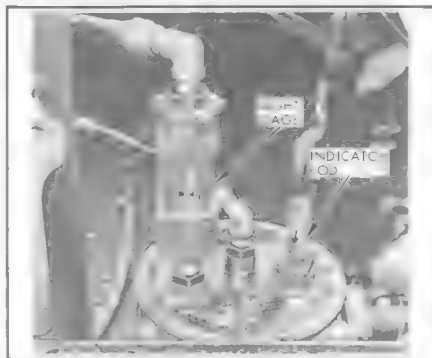
**4** Provide a container for the reservoir overboard line.

**Note** When reservoir is full, hydraulic fluid will drain overboard aft of main landing gear strut well. This is a normal condition during servicing procedure.



**5** Pump fluid into the reservoir until air-free fluid is flowing through the reservoir sight gage.

**6** The fluid level indicator rod should be within one-fourth inch of top of rod housing.



## INITIAL FILLING OF COMPLETE FLIGHT CONTROL HYDRAULIC SYSTEM.

**1** Follow steps for servicing flight control system reservoir.

**2** Connect hydraulic test stand lines to "PRESSURE" and "SUCTION" fittings on the ground test connection panels for No. 1 and No. 2 systems. Regulate test stand to deliver 500 psi to the systems and cycle systems several times by moving control stick fore and aft and from side to side until no air bubbles appear in reservoir sight gage.

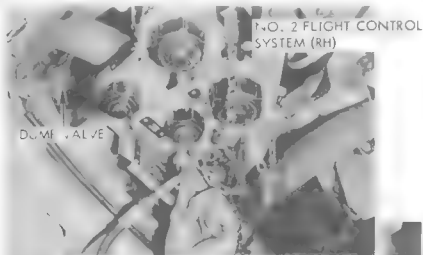
**3** Shut down hydraulic test stand and repeat servicing instructions for flight control hydraulic system reservoir.

**Note** Supplying fluid through the "RESERVOIR LINE" fills the reservoir in the system only. Cycling the system, while pressurized, circulates the fluid from the reservoirs to the lines and components of the system. Repeating the filling operation after cycling the system will assure a properly serviced system.

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## CHECKING ACCUMULATOR PRECHARGE

- 1 Actuate accumulator dump valve for several seconds.

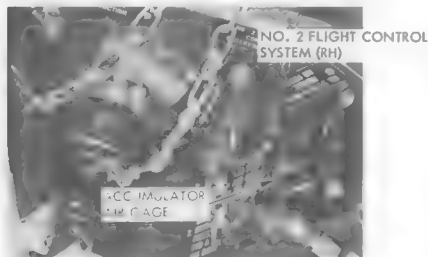


NO. 1 FLIGHT CONTROL SYSTEM (LH)



- 2 Wait several minutes for temperature to stabilize.

- 3 If necessary, add dry air or nitrogen to obtain 600 (+50/-0) psi reading on the accumulator air gage and operate dump valve again to be assured of correct precharge.



NO. 1 FLIGHT CONTROL SYSTEM (LH)

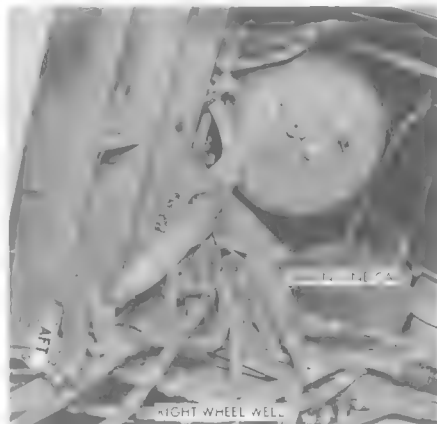


**Warning** Refer to paragraph 1-39 for charging units through high-pressure air valves.

## DRAINING FLIGHT CONTROL HYDRAULIC SYSTEM RESERVOIR

- 1 Discharge the accumulator hydraulic pressure by operating the dump valve.
- 2 Provide container under drain outlet in the lower engine bay area.
- 3 Remove cap from drain line.

## NO. 2 FLIGHT CONTROL SYSTEM (RH)



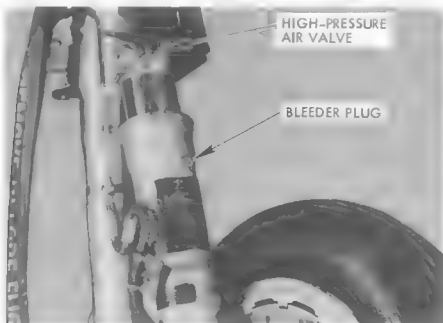
## NO. 1 FLIGHT CONTROL SYSTEM (LH)



### 1-43. SERVICING LANDING GEAR SHOCK STRUTS.

#### SERVICING MAIN GEAR STRUTS

- 1 With air pressure released and strut fully compressed, remove filler valve and bleeder plug.
- 2 Fill strut with hydraulic fluid (item 95, materials list) until fluid flows from bleeder port.

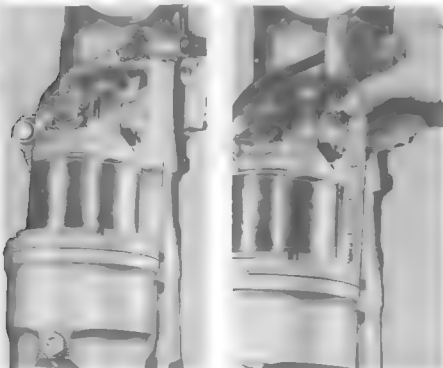


- 3 Secure bleeder plug and fill to level of filler valve port.
- 4 Install filler valve and charge strut with nitrogen or dry air.

**Warning** Follow instructions in paragraph 1-39 for charging units equipped with high-pressure air valves.

- 5 Measure main landing gear strut extension for 3-7/8 inches of uncompressed strut length.

**Note** Strut extension of 3-7/8 inches should be maintained regardless of airplane gross weight.



**Warning** Because of the relatively high pressure and the small quantity of air in the landing gear struts, caution must be used in releasing the air from the struts. Make sure that personnel are clear of the airplane in the event of sudden compression of the strut. Also see that no jacks, work stands or other obstacles are under the airplane when the struts are deflated.

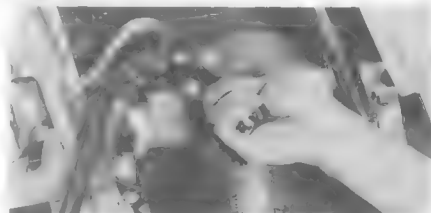


#### Warning

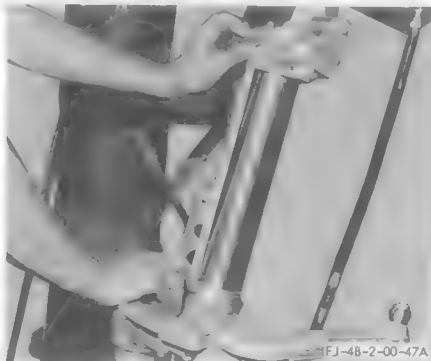
**Note** Follow the instructions in paragraph 1-39 for releasing air pressure from high-pressure air valves.

#### SERVICING NOSE GEAR STRUT

- 1 With air pressure released and strut fully compressed, remove high pressure air valve.
- 2 Fill strut with hydraulic fluid (item 95, materials list) to level of filler hole.
- 3 Install high pressure air valve and charge strut with nitrogen or dry air. Follow instructions in paragraph 1-39.



- 4 Measure nose landing gear strut extension for 12-1/4 inches of uncompressed strut length as indicated on strut name plate.

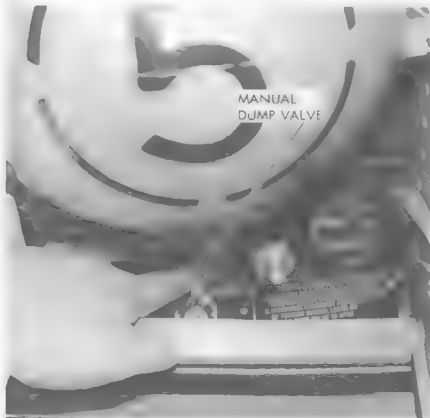




## 1.44. SERVICING NOSE GEAR EMERGENCY EXTENSION SYSTEM.

## SERVICING

- 1** Operate manual dump valve to release any hydraulic pressure.



- 2** Precharge accumulator to 1200 ( $\pm 50$ ) psi with air or nitrogen through the high-pressure air filler valve.

**Note** Refer to paragraph 1-39 for servicing this system through high-pressure air valves.



- 3** Operate dump valve again to be assured of correct air precharge. If precharge is low, repeat step 2.

**Caution** The accumulator will automatically charge to a pressure of 3000 psi upon engine run-up or ground test stand operation providing the weight of the airplane is on the main gear. During ground operation of system, pressure surges may be trapped in the accumulator. Pressures up to 4000 psi are acceptable.

**Note** Pressures specified are actual system pressures and do not include accumulator gage error; therefore the accuracy of the accumulator gage should be known. Maximum allowable gage error is  $\pm 150$  psi.

OPERATION OF NOSE GEAR  
EMERGENCY EXTENSION

In the event of an electrical or hydraulic failure, the landing gear is lowered through an emergency extension system. To extend the nose gear, the actuation of the cable linkage first arms the emergency selector valve by moving the valve bell crank overcenter. The valve is then actuated after 20 to 45 degrees of gear free fall by means of a bungee connected to a crank on the left-hand nose gear trunnion pin. The opening of the emergency valve releases the emergency accumulator pressure to the nose gear actuating cylinder, enabling it to complete the extension of the gear against the air stream to the down and locked position.

**Caution** After an emergency extension has been made, the emergency extension selector valve must be reset by a handle located inside the wheel well.

**Warning** Stand clear of wheel door when resetting valve.



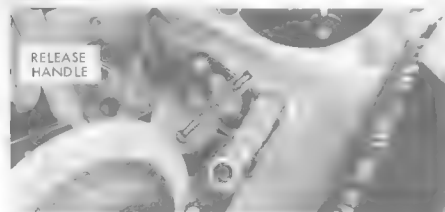
# 1-45. SERVICING RAM-AIR TURBINE BUNGEE.

## SERVICING

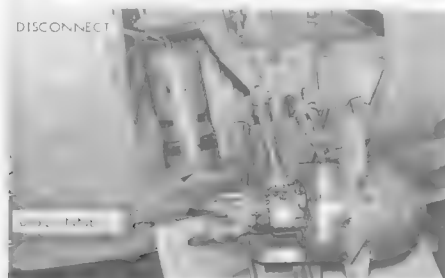
**Warning** To prevent serious injury to personnel or damage to the door, be sure that the area around and below the door is clear of any obstructions prior to extension of the turbine. If maintenance is required in the immediate area while the turbine door is in the retracted position, the warning flag should be checked for being in the safe (flush) position.



- 1** Pull TURB RELEASE handle in cockpit to release turbine.

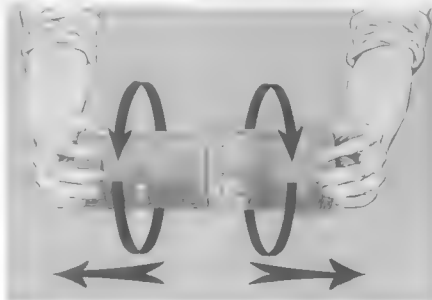


- 2** Disconnect bungee from turbine operating bell crank.

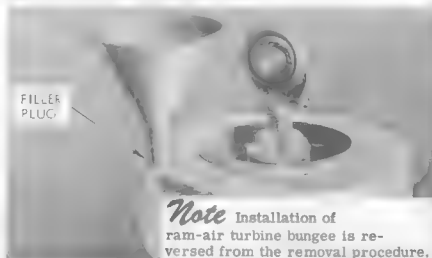


- 3** Disconnect lower end of bungee from fuselage attach point and remove from compartment.

- 4** Remove air from the bungee by moving it back and forth then in a circular motion as shown.



- 5** Remove filler plug and fill the bungee with hydraulic fluid (item 95, materials list).



**Note** To facilitate closing ram-air turbine door, use special tool, T-2738.

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## 1-46. SERVICING TIRES.

## DESCRIPTION

The nose wheel uses a type VII 20 x 4.4, 10 ply, tubeless or tubetype tire, each accommodating a type VII 20 x 4.4 tube. The main wheels use two type VII 26 x 6.6, 14 ply, tubeless tires. The tubeless tire is identified by the word "TUBELESS" which is molded into the sidewall. The tire is constructed so that during mounting, the toe of the bead connects to the ledge of the wheel to provide initial sealing. The wheel flanges are not knurled.

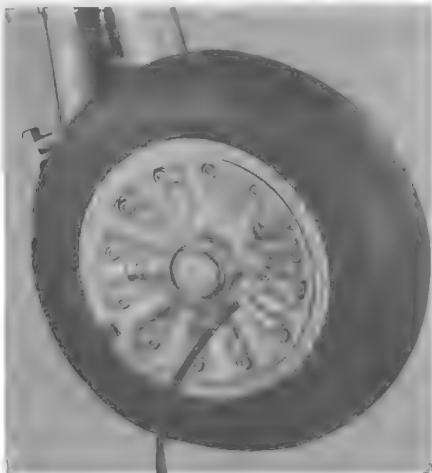
## GENERAL INFORMATION

The greatest loss of pressure will be experienced during the first 48 hours after initial inflation of a new tubeless tire. This loss is no greater than that experienced in conventional tire and tube combinations and is attributed to increased volume because of tire growth. Uneven rind at the toe of the bead is not considered detrimental.

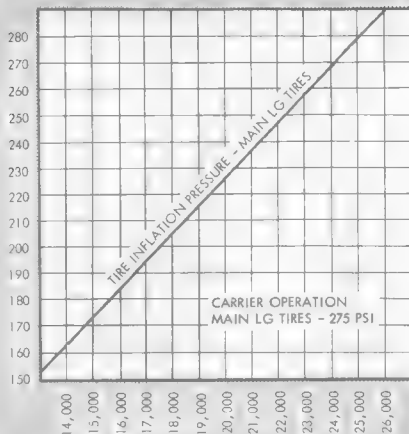
If excessive loss of pressure is detected, the first item to check is the valve core. If the valve is not leaking, the wheel should be removed from the aircraft. Remove bearings and submerge tire and wheel in water. If no bubbles are noticed around the flanges, sidewalls or tread area, it can be assumed that the tire is leak-free.

The wheel bearing caps should be dried and coated with a light application of lubricating grease (item 83, materials list) immediately following submersion to prevent corrosion and damaged cups.

**Caution** Wheel bearings should not be handled with bare hands. Use cloth gloves.



TIRE INFLATION PRESSURE (PSI)\*



AIRPLANE GROSS WEIGHT (TAKE-OFF)  
(PRESSURES GIVEN ARE FOR HARD-SURFACE RUNWAY)

NOSE GEAR TIRE INFLATION  
HARD SURFACE RUNWAY - 165 PSI  
CARRIER OPERATION - 300 PSI

\*INFLATION TOLERANCE: 5 PSI

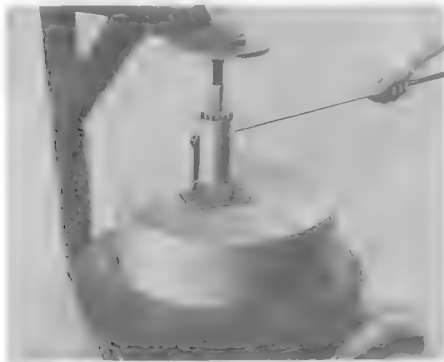
## CARE AND MAINTENANCE OF TIRES

If breaks, cuts, large blisters, or other visible damage appears, or if the tread pattern has completely disappeared from one or more sections of the tire, the tire must be removed from service. Weather checking on the tire surface is not considered a hazardous condition, but if the checking has penetrated to the core, deterioration may occur and the tire should be removed from service. Replace all tires that have exposed cords, regardless of cause. When a tire shows excessive evidence of cupping or uneven wear from camber or toe-in condition, the tire should be removed and reversed on the same wheel and the wheel condition checked and corrected. If there is visible evidence of wheel rim rust or corrosion, thoroughly buff the rim and refinish with a protective coating. Allow the refinished area to dry before remounting the tire. Surface oil and grease should be removed by wiping with a cloth moistened with naphtha (item 91, materials list) or solvent (item 119, materials list).

FJ-48-2-00-50 A

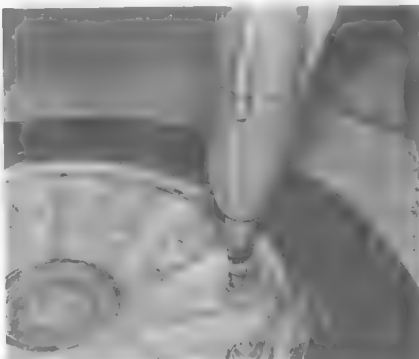
### DISMOUNTING TIRE

**1** To deflate tires, depress valve core with appropriate tool to allow air to escape before removing core from the valve stem. Remove wheel from aircraft after valve core has been removed.



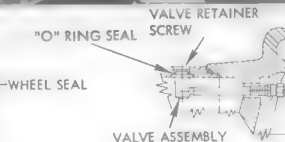
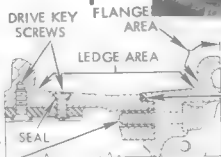
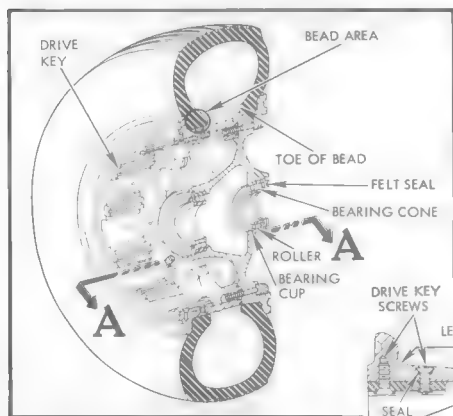
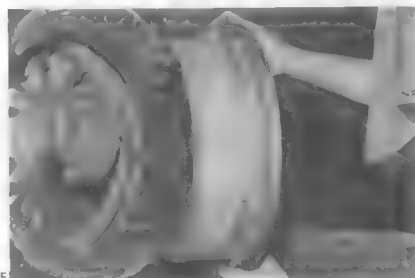
**2** Break beads from both flanges by applying even pressure around entire circumference of each side wall.

**3** Remove nuts, bolts and washers which secure wheel halves.



**Caution** Do not pry between flange and bead with a sharp object, or the wheel may be damaged, destroying its sealing qualities.

**4** Separate wheel halves and remove tire.



WHEEL HALF BOLT

### WHEEL INSPECTION

**1** Check for scratches, flaws or other imperfections in flange and ledge area and check to see that this area is free of foreign material.

**2** Inspect wheel half, sealing gasket and sealing of drive key screws which extend into ledge.

**Note** At each disassembly of the wheel, clean the seal and seal mating surfaces with a cloth dampened with denatured alcohol (item 6, materials list). Experience will dictate how often this seal should be replaced.

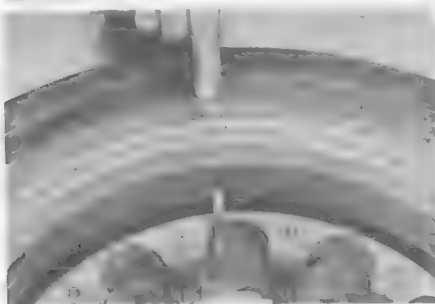
**Caution** Do not lubricate wheel half seal.

FJ-48-2-00-51

### SECTION A-A

## MOUNTING

- 1** Place inboard wheel half on a flat surface and position tire on wheel half with balance mark at valve stem.



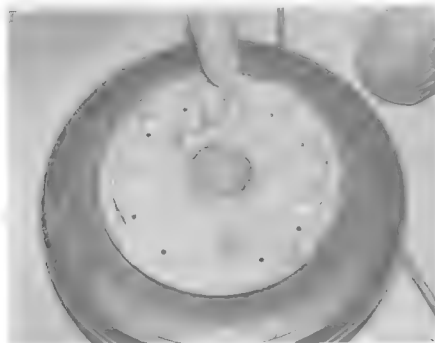
**Caution** Care should be exercised to avoid misaligning or damaging the wheel seal. No lubricant (including soap or talcum) of any kind is permitted to be used on wheel rim or tubeless tire.

- 2** Position outboard wheel half in tire, aligning valve hole if required.

**Note** Halves of divided wheels are balanced individually.

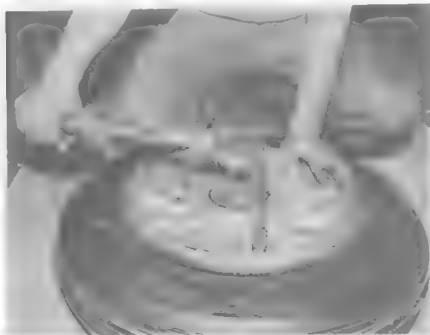
- 3** Install wheel half bolts as follows:

- A. Compress wheel halves enough to allow installation of four bolts 90 degrees apart; draw up evenly until wheel halves seat; then install remaining wheel half bolts.



**Caution** When chamfered washers are used on wheel half bolts, the chamfer should face the boltheads. Lubricate bolt threads and bearing surfaces of washers and boltheads with anti-seize compound (item 131, materials list).

- B. Tighten all bolts in increments of 5 foot-pounds to 20 foot-pounds; then tighten to the torque value specified on the wheel.



**Note** It is recommended that bolts be tightened in a criss-cross order.

- 4** Inflate with enough air to seat beads properly (100 psi maximum).



- 5** Install wheel on aircraft in conventional manner and inflate to operating pressure.

**Note** Lubricate wheel bearings and felt seals as per instructions in figure 1-17, sheet 3.

- 6** Check valve for proper sealing and security of valve locking nut.

**Note** For equal braking action, the main gear tire treads should be similar in design.

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1-47. SERVICING ARRESTING GEAR SNUBBER.

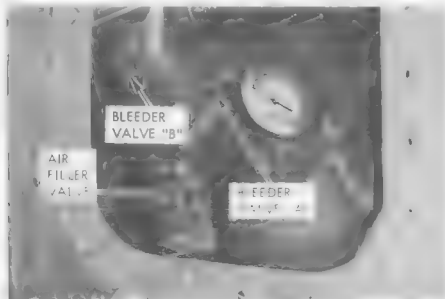


*Note*

- Service snubber with hook in retracted position.
- Use hydraulic fluid (item 95, materials list).

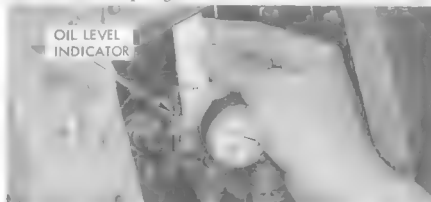
**1** Remove bleeder screw from bleeder valve "A" and bleeder valve "B." Remove cap from high-pressure air valve. Refer to paragraph 1-39 for charging and discharging air through high-pressure air valves.

**2** Release air pressure through air filler valve.

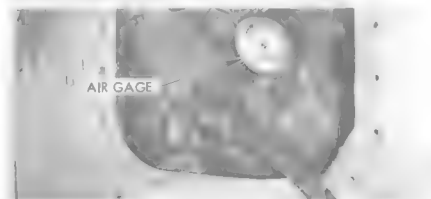


**3** With bleeder valve "B" closed, open bleeder valve "A" and connect fluid supply unit.

**4** Fill with fluid under pressure (500 psi maximum) until oil level indicator is lowered to approximately one inch below top of guide.



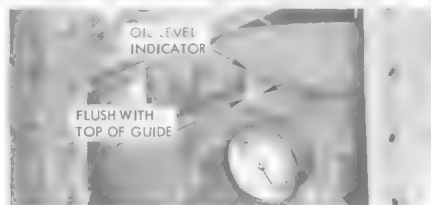
**5** Close bleeder valve "A," connect compressed air or dry nitrogen pressure source to air filler valve and inflate to approximately 100 psi. Oil level indicator will be fully extended.



**6** Open bleeder valve "B" and bleed until free of air bubbles.

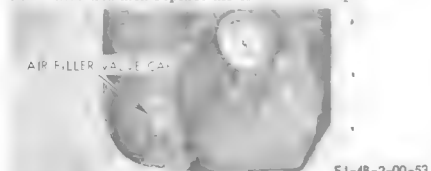
*Note* If necessary, repeat previous steps until air-free fluid is flowing from bleeder valve "B."

**7** Close bleeder valve "B." Open bleeder valve "A" and bleed until fluid is free of air. Continue to bleed through bleeder valve "A" until oil level indicator is lowered to full position (flush with top of guide).



**8** Close bleeder valve "A" and replace bleeder screws.

**9** Inflate to 500 psi air pressure through air filler valve and then replace air filler valve cap.



FJ-48-2-00-53

## 1-48. SERVICING PNEUMATIC SYSTEM.

SERVICING GUN CHARGER COMPRESSOR  
WITH OIL

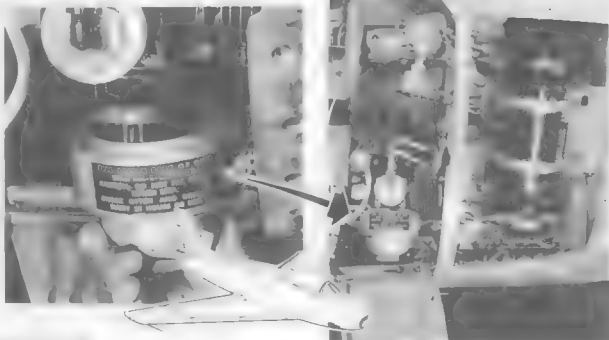
The oil sump located on the bottom of the compressor is serviced with oil (item 86, materials list) as follows:

**1** Remove lubricant cup by loosening knurled knob and lowering it clear of the compressor.

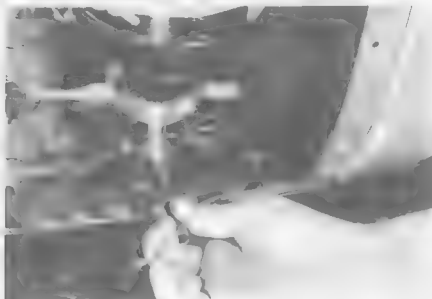
**2** Fill lower portion of cup with oil.

**Caution** Do not fill above the lower step of the cup.

**3** Position cup under compressor and lock in place by turning knurled knob.



## FILLING GUN CHARGER AIR BOTTLE



**Note** Moisture may be removed from gun charger air bottle by loosening drain plug as shown.

To fill gun charger air bottle, proceed as follows:

**1** Remove filler cap and attach air filler line.

**2** Charge system through the filler fitting with compressed dry air or nitrogen to a 1500 psi reading on the gage.



## REPLACING CHEMICAL DRIER CARTRIDGE



To replace the chemical drier cartridge (P/N 870278), proceed as follows:

**1** Remove the hex head plug and cartridge from out-board end of drier.

**2** Break seals on the new cartridge.

**3** Replace cartridge "O" ring if damaged during removal and insert new cartridge.

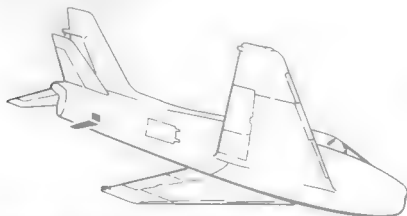
**4** Install hex head plug with "O" ring and tighten.

**Note** The gun charger equipment access panel must be removed to replace the chemical drier cartridge and to drain the gun charger air bottle.

FJ-48-2-00-54

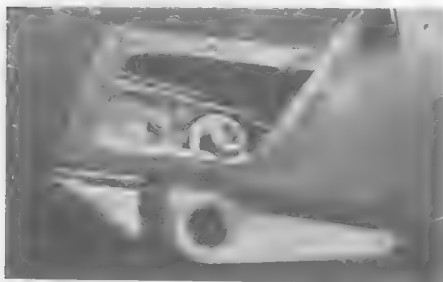
# 1-49. RESETTING TAIL BUMPER.

The tail bumper installation on the airplane is a forged steel skid that protrudes below the mold line near the aft end of the airplane, approximately on the lower centerline. A friction clutch is incorporated and if the bumper is ever subjected to a vertical load of about 7000 pounds, the clutch will allow the skid to rotate and absorb the energy involved before any damage occurs to the aft section of the fuselage or aspirator.

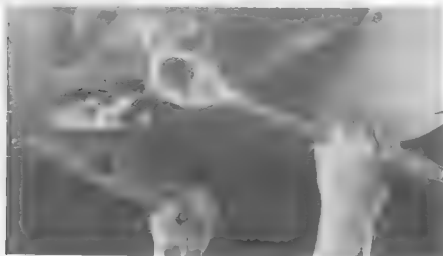


Normally, there is no maintenance or adjustment required for the tail bumper installation. If the bumper is struck hard enough on landing to rotate the unit, it must be reset as follows:

- 1 Remove access door on left-hand side of fuselage adjacent to tail bumper.



- 2 Loosen bolt and reset bumper against its stop.



- 3 Torque bolt to 300 ( $\pm 10$ ) foot-pounds.



- 4 Safety-wire bolt with AN995F47 wire.

- 5 Replace access door.

**Caution** At no time should any grease or oil be used on the friction clutch.

**Caution** Replace tail bumper when it wears to dimension shown. Aspirator will be damaged if skid wears shorter.





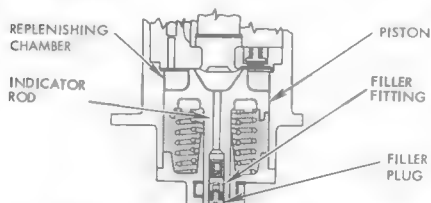
## 1-50. SERVICING NOSE GEAR SHIMMY DAMPER.

## 1-51. SERVICING REFRIGERATION UNIT.

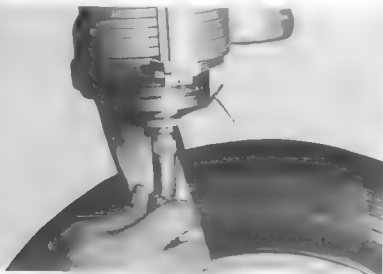
REPLENISHING NOSE LANDING GEAR  
SHIMMY DAMPER

- 1** Remove filler plug from the end of the indicator rod.

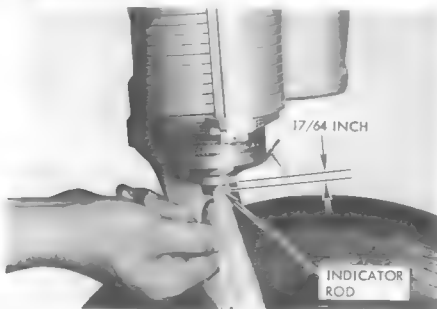
**Caution** Do not remove the filler fitting. If fitting is removed, unit must be drained, air bled and refilled.



- 2** Install a lubrication fitting having a 1/8-inch pipe thread [Alemite P/N 1613 (90°), P/N 1614 (105°) or equivalent]. Then attach a clean pressure gun with snap-on nozzle filled with hydraulic fluid (item 95, materials list).

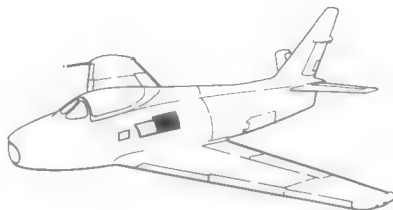


- 3** Force fluid into reservoir until indicator rod extends 17/64 inch.

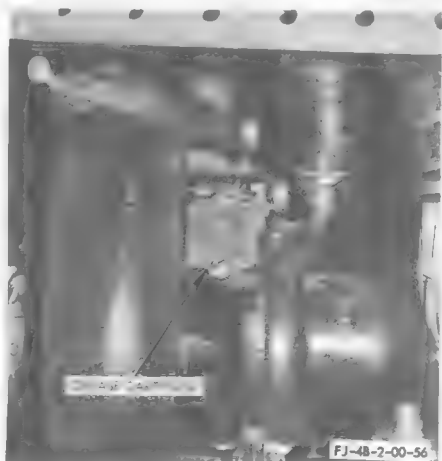


- 4** Reinstall filler plug.

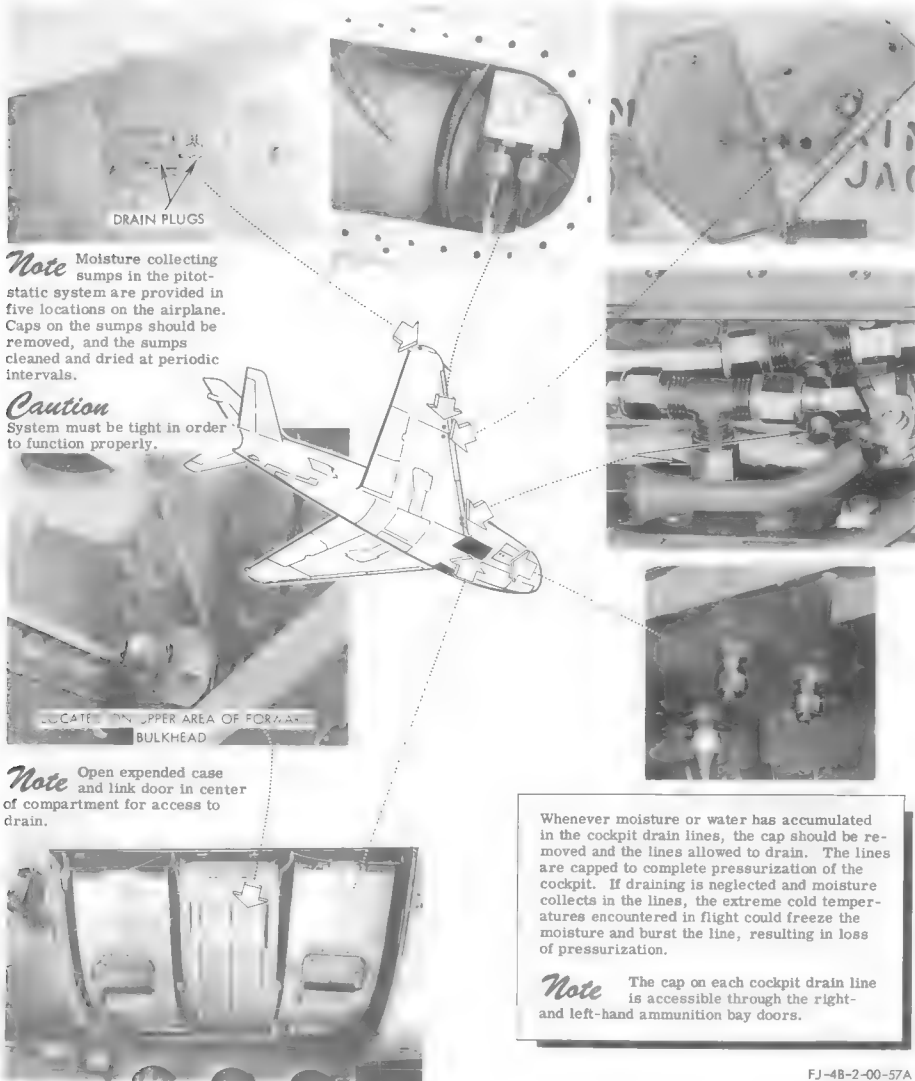
FJ-48-2-00-58



The refrigeration unit is accessible through the refrigeration unit access door below the aft end of the canopy on the left-hand side of the fuselage. The unit has a prepacked cartridge-type grease container which is to be replaced at periodic intervals. Before installing grease cartridge, remove plastic cap and cork gasket inside cap and check that felt wick is either flush with or protruding 1/16 inch from threaded end of cartridge. If wick is found to be recessed, pull it out to the proper position. In addition, punch a 1/16-inch diameter hole in the top of any cartridge that does not have a vent hole.



1-52. DRAINING PITOT-STATIC SYSTEM AND  
DRAINING COCKPIT DRAIN LINES.



FJ-4B-2-00-57A

## LUBRICATION REQUIREMENTS

## 1-53. LUBRICATION REQUIREMENTS.

1-54. The proper lubrication of high-performance aircraft cannot be overemphasized. Lack of proper lubrication has undoubtedly been a contributing cause for various part failures. The charts provided herein give proper location, lubricant type and intervals for lubrication. Proper utilization of these charts (figure 1-17) will add to the performance and availability of the aircraft. A Table of Lubricants is provided in figure 1-16.

## Note












Remove all old lubricants and foreign matter from the external area of joints, fittings or bearing surfaces immediately prior to application of lubricants. Use a clean cloth saturated with cleaning solvent (item 119, materials list). Apply lubricant sparingly to prevent accumulation of contaminants. When applying lubricants through pressure-type fittings, make sure the lubricant has emerged around bushing; then wipe off the excess.

## Note

When using guns with flush adapters, they must be held perpendicular to the surface of the fitting. A 15-degree variation is permissible.

## CAUTION

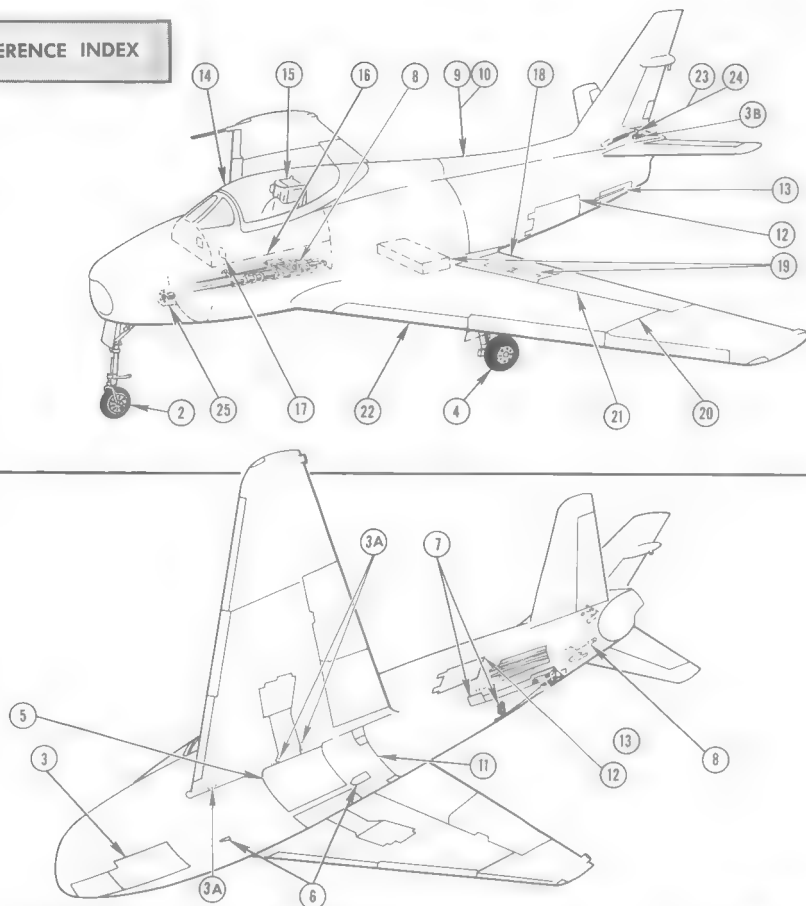
Synthetic compounds such as Specification MIL-G-3278 (item 61, materials list) contain elements that may soften paint, natural rubber, neoprene and electrical materials. If any of this lubricant spills on any of these materials, wipe off thoroughly with a clean cloth.

| TABLE OF LUBRICANTS |                                      |                                  |   |   |
|---------------------|--------------------------------------|----------------------------------|---|---|
| PARA 1-87 ITEM NO   | IDENTIFICATION SPECIFICATION LETTERS |                                  | TYPE OF LUBRICATION   | FREQUENCY SYMBOLS   |
| 61                  | GLT                                  | MIL-G 3278                       | GREASE; AIRCRAFT AND INSTRUMENTS (LOW AND HIGH TEMPERATURE) | INTERMEDIATE (25/30 HOURS)   |
| 88                  | OGP                                  | MIL-L 7870                       | LUBRICATING OIL; (GENERAL-PURPOSE, LOW TEMPERATURE)         | 2ND INTERMEDIATE (50/60 HOURS)   |
| 83                  | GH                                   | MIL-L-3545                       | LUBRICATING GREASE; HIGH TEMPERATURE                        | MAJOR (100/120 HOURS)    |
| 60                  | FG                                   | MIL-G-6711                       | GRAPHITE; LUBRICATING                                       | APPLICATION SYMBOLS<br> BRUSH  OIL CAN<br> HAND  GREASE GUN<br> FLUSH  FITTING<br><small>USE GREASE GUN NOZZLE ADAPTERS</small><br> T 2744<br> T 2745 |
| 64                  | GG                                   | MIL-G 7187                       | GREASE; GRAPHITE, AIRCRAFT LUBRICATING                      |   |
| 131                 | CSP                                  | MIL-T 5544                       | COMPOUND, ANTI SEIZE; GRAPHITE PETROLATUM                   |   |
| 85                  | GPS                                  | MIL-L 4343                       | GREASE, PNEUMATIC SYSTEM                                    |   |
| 79                  | GLT                                  | J-941-L-4025<br>MIL-L 19701 NORd | LUBRICATING GREASE<br>NRL GLT 700-60                        |   |

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Figure No. 1-16. Table of Lubricants

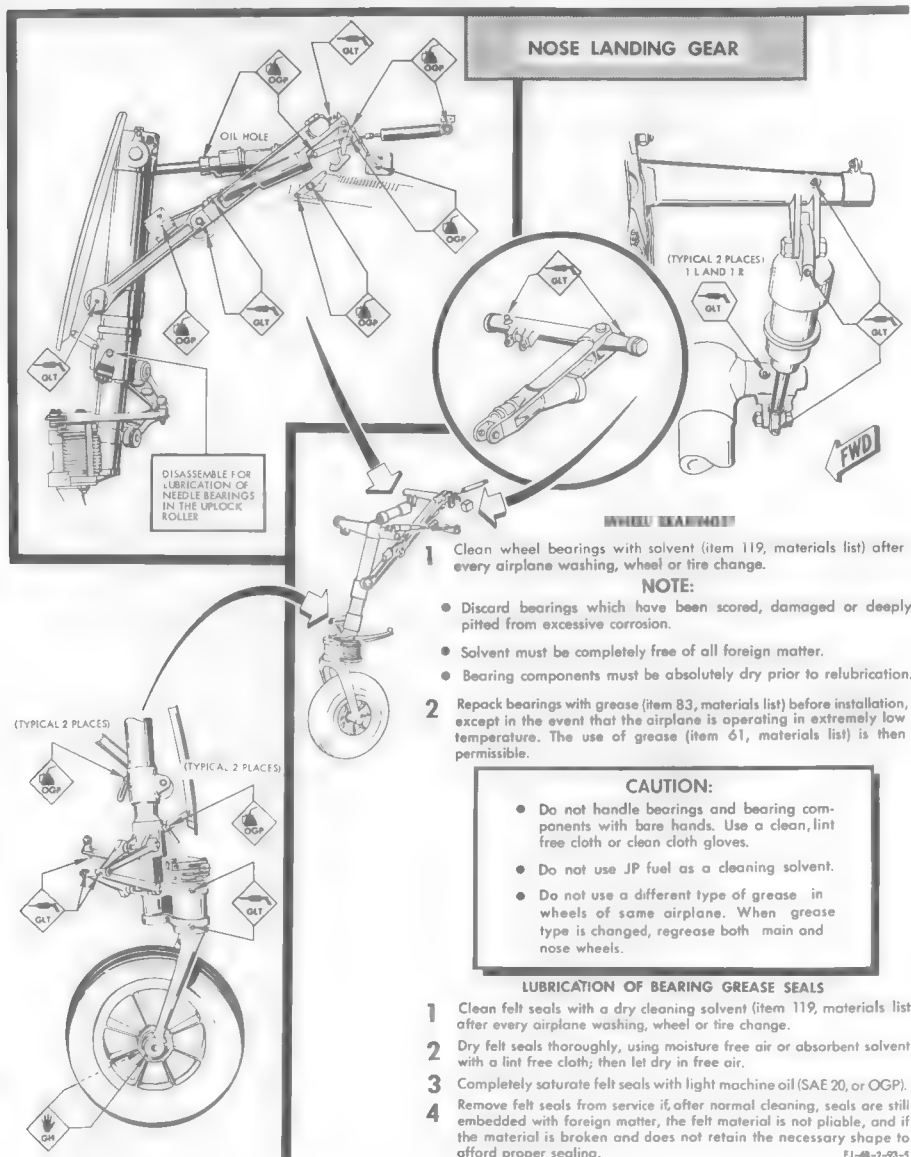
REFERENCE INDEX



| ITEM                            | SHEET NO. | ITEM                      | SHEET NO. |
|---------------------------------|-----------|---------------------------|-----------|
| NOSE LANDING GEAR               | 2         | CANOPY                    | 14        |
| NOSE GEAR DOOR                  | 3         | EJECTION SEAT             | 15        |
| SEALANT INJECTION FITTINGS      | 3A        | COCKPIT CONTROLS          | 16        |
| LUBRICATING FLUSH FITTINGS      | 3B        | RUDDER PEDALS             | 17        |
| MAIN LANDING GEAR               | 4         | WING FLAPS                | 18        |
| MAIN GEAR DOORS                 | 5         | WING FLAP SPOILERS        | 19        |
| CATAPULT HOOK AND HOLDBACK      | 6         | WING FOLD                 | 20        |
| ARRESTING GEAR AND SNUBBER      | 7         | AILERON                   | 21        |
| TOW TARGET RELEASE AND ARMAMENT | 8         | WING LEADING EDGE         | 22        |
| FUSELAGE                        | 9 & 10    | HORIZONTAL STABILIZER AND |           |
| ENGINE ACCESS DOOR              | 11        | ELEVATOR CONTROL LINKAGE  | 23 & 24   |
| SPEED BRAKES                    | 12 & 13   | RAM-AIR TURBINE RELEASE   | 25        |

FJ-48-2-93-4C

Figure No. 1-17. Lubrication Chart (Sheet 1)



**Figure No. 1-17. Lubrication Chart (Sheet 2)**



1-102

*Caution*

- The wings on the airplane are so constructed that they require a sealant injected in grooves around the boundary of the fuel cells. There are four sealant injection fittings which resemble a typical lubricating fitting installed in each wing. These fittings are located on the forward wing to fuselage attach point (one uncovered), the forward area of the main wheel well inboard on intermediate wing to fuselage attach point (one capped) and the aft area of main wheel well inboard on rear spar (two capped).
- Do not attempt to lubricate these sealant injection fittings under any circumstances.

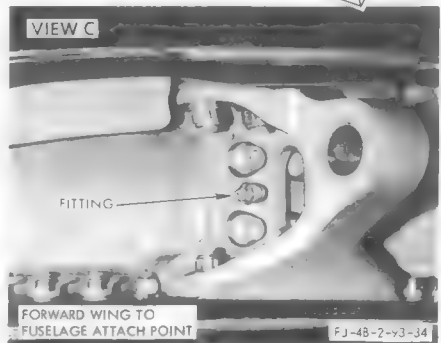
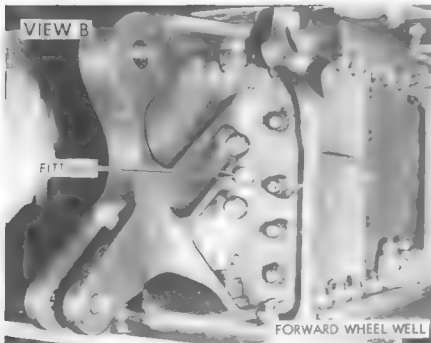
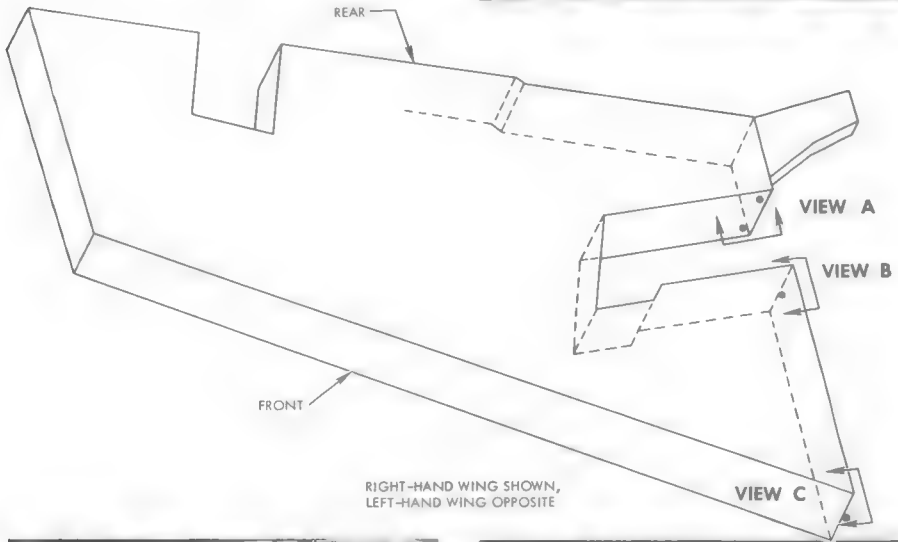
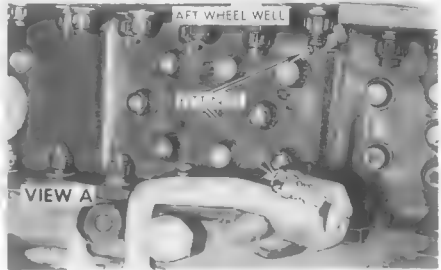
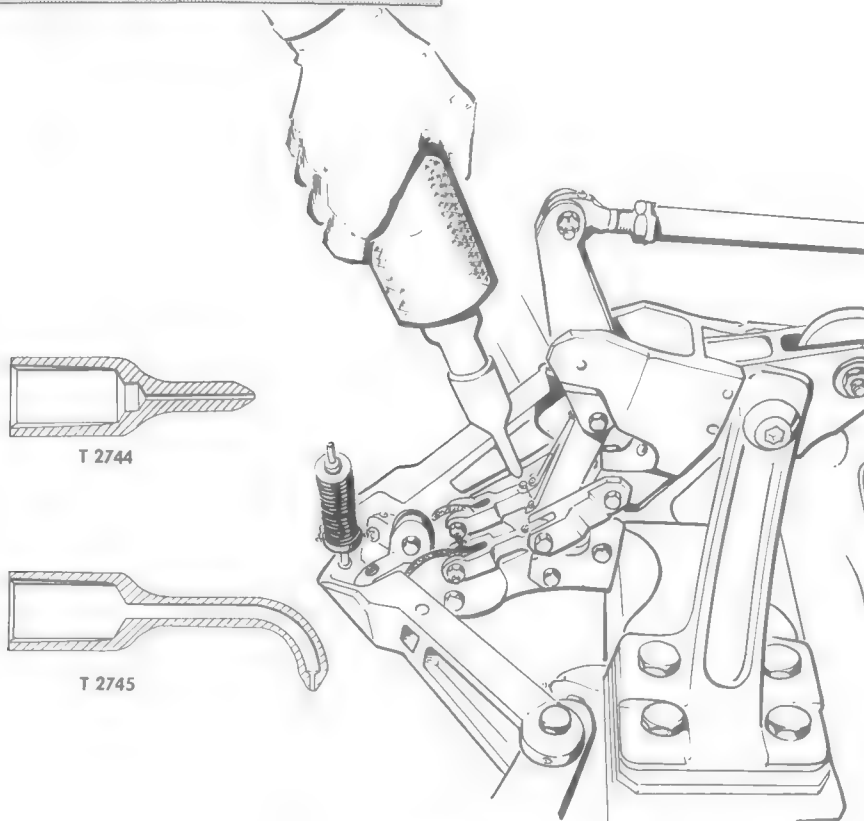


Figure No. 1-17. Lubrication Chart (Sheet 3A)

LUBRICATING NAS 516 FLUSH FITTINGS



*Note*

LUBRICATE NAS516 FLUSH FITTINGS WITH GREASE GUN NOZZLE ADAPTER T2744.

FOR FITTINGS WHICH ARE INACCESSIBLE TO A STRAIGHT ADAPTER, USE 90° NOZZLE ADAPTER T2745.

Figure No. 1-17. Lubrication Chart (Sheet 3B)



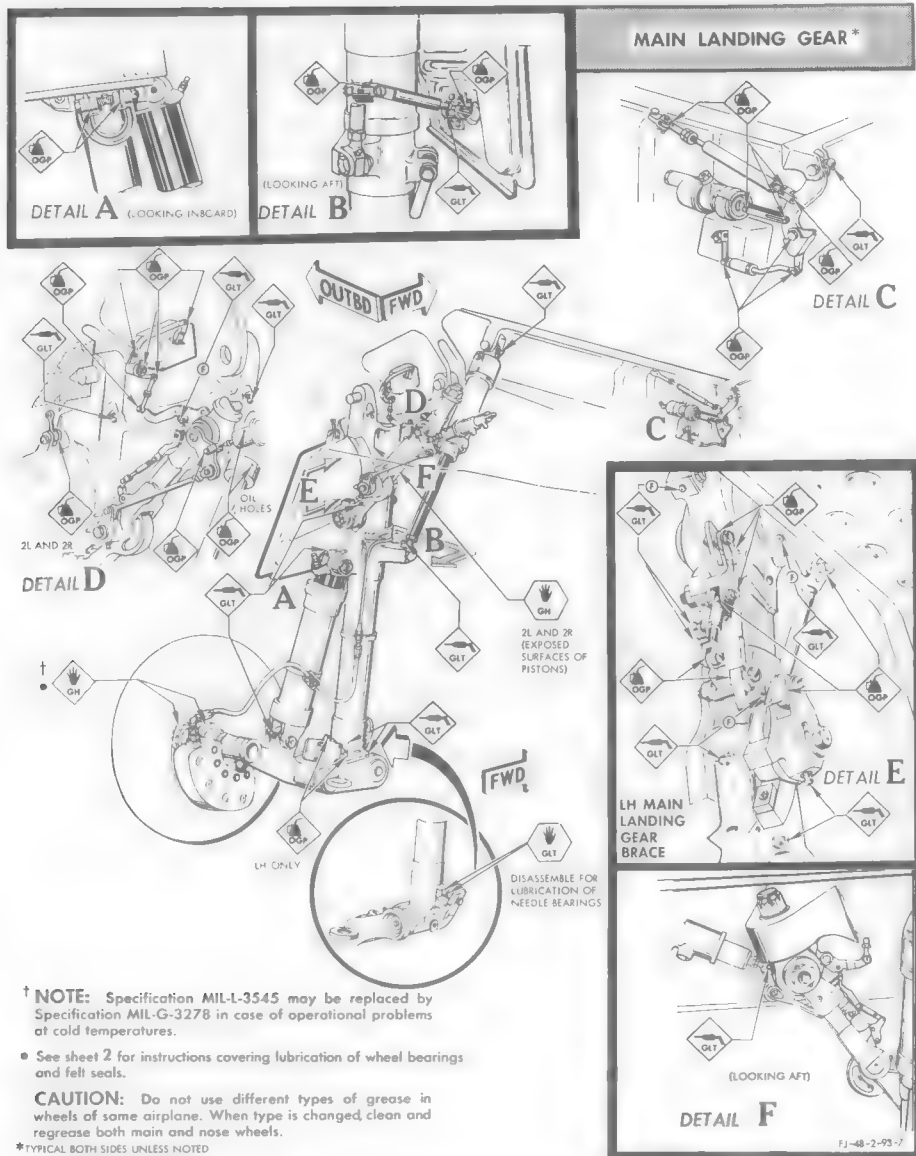


Figure No. 1-17. Lubrication Chart (Sheet 4)

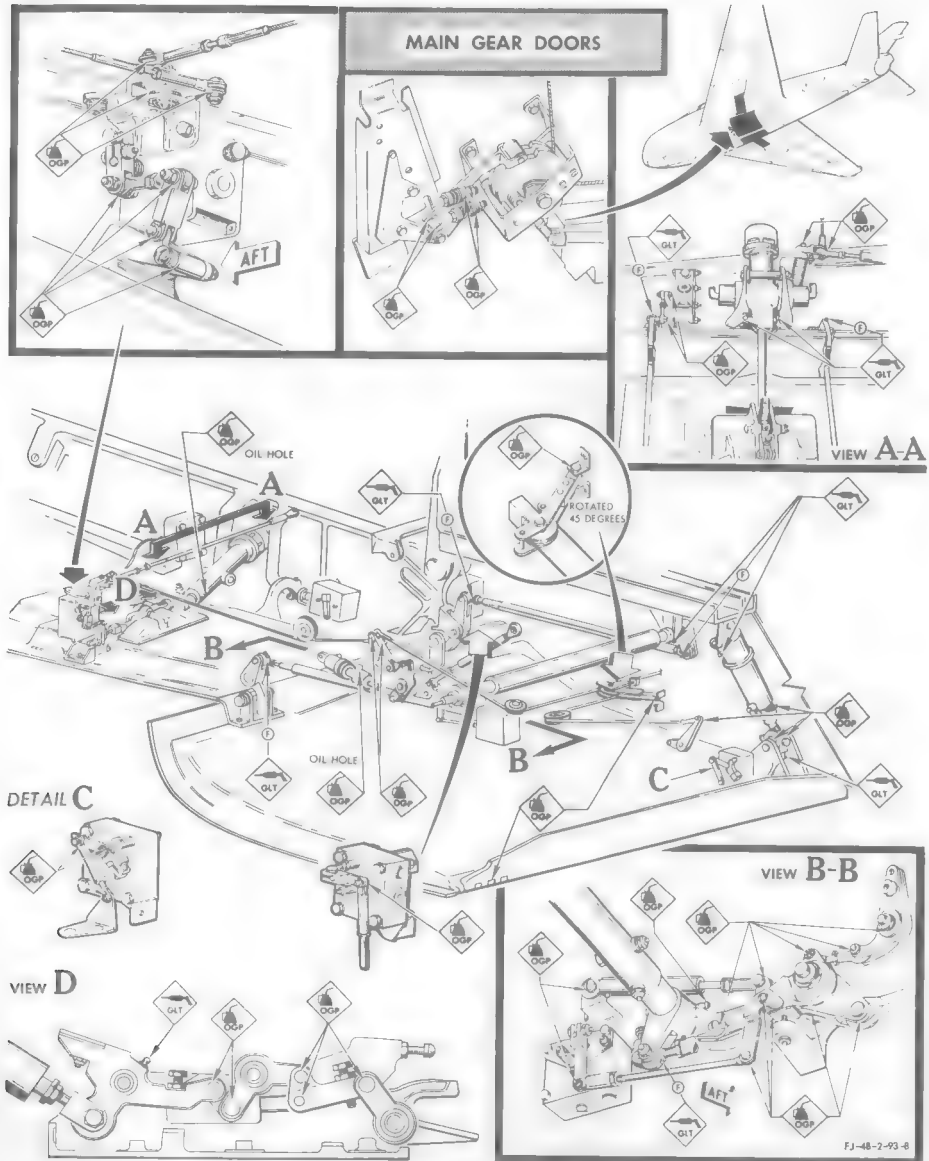
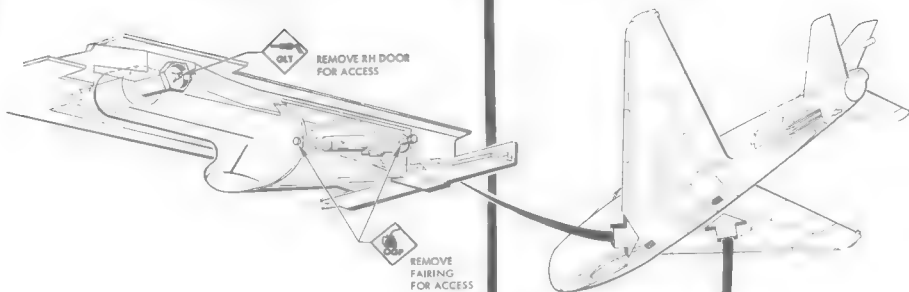
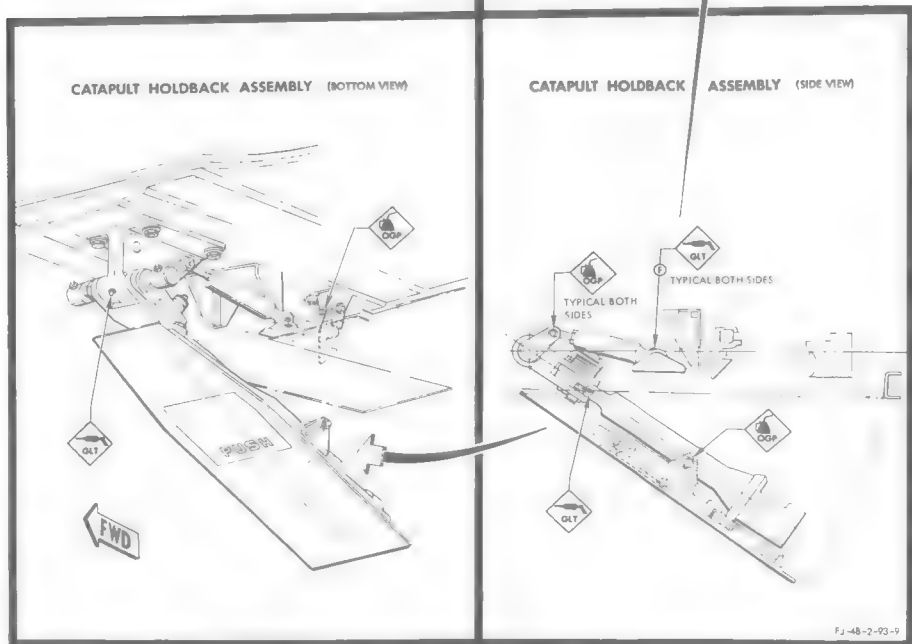


Figure No. 1-17. Lubrication Chart (Sheet 5)

## CATAPULT HOOK AND HOLDBACK

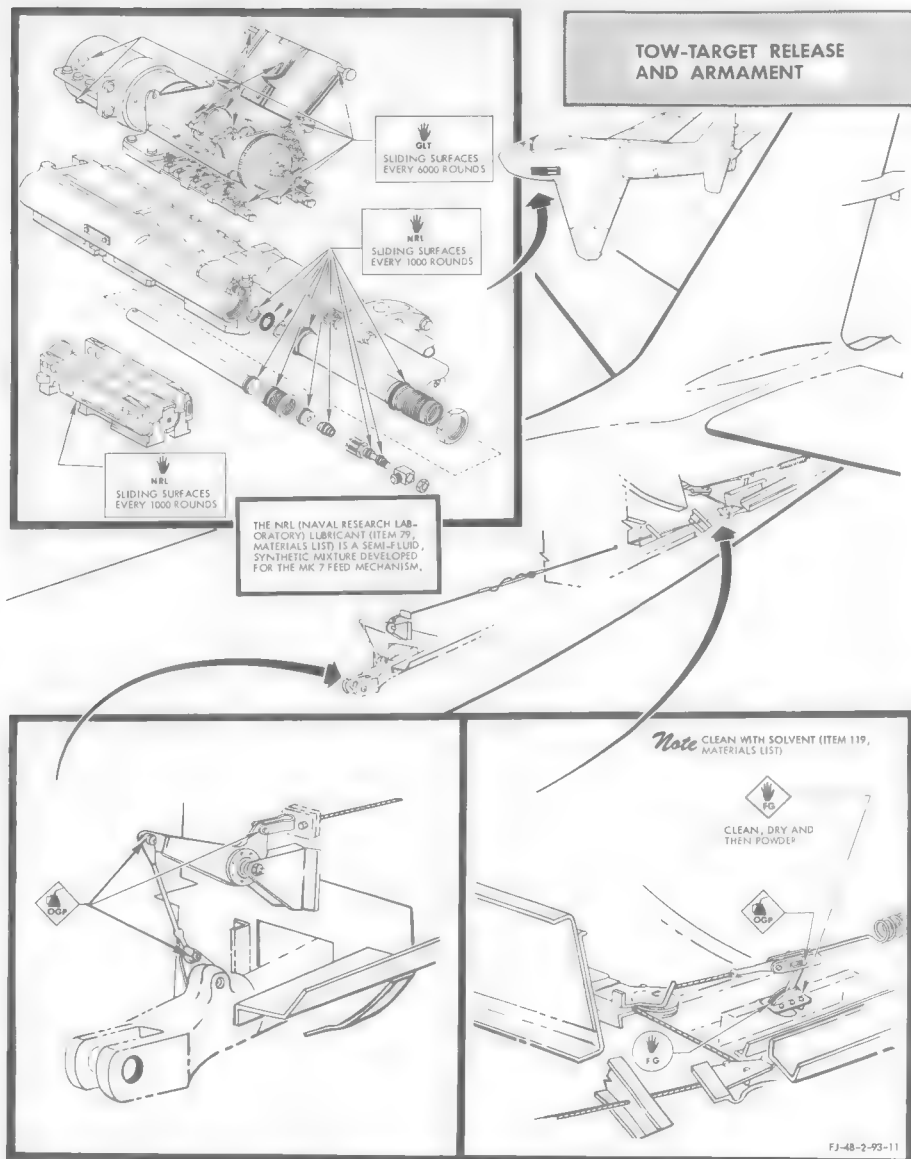


**CATAPULT HOOK (BOTTOM VIEW)**



**Figure No. 1-17. Lubrication Chart (Sheet 6)**





**Figure No. 1-17. Lubrication Chart (Sheet 8)**

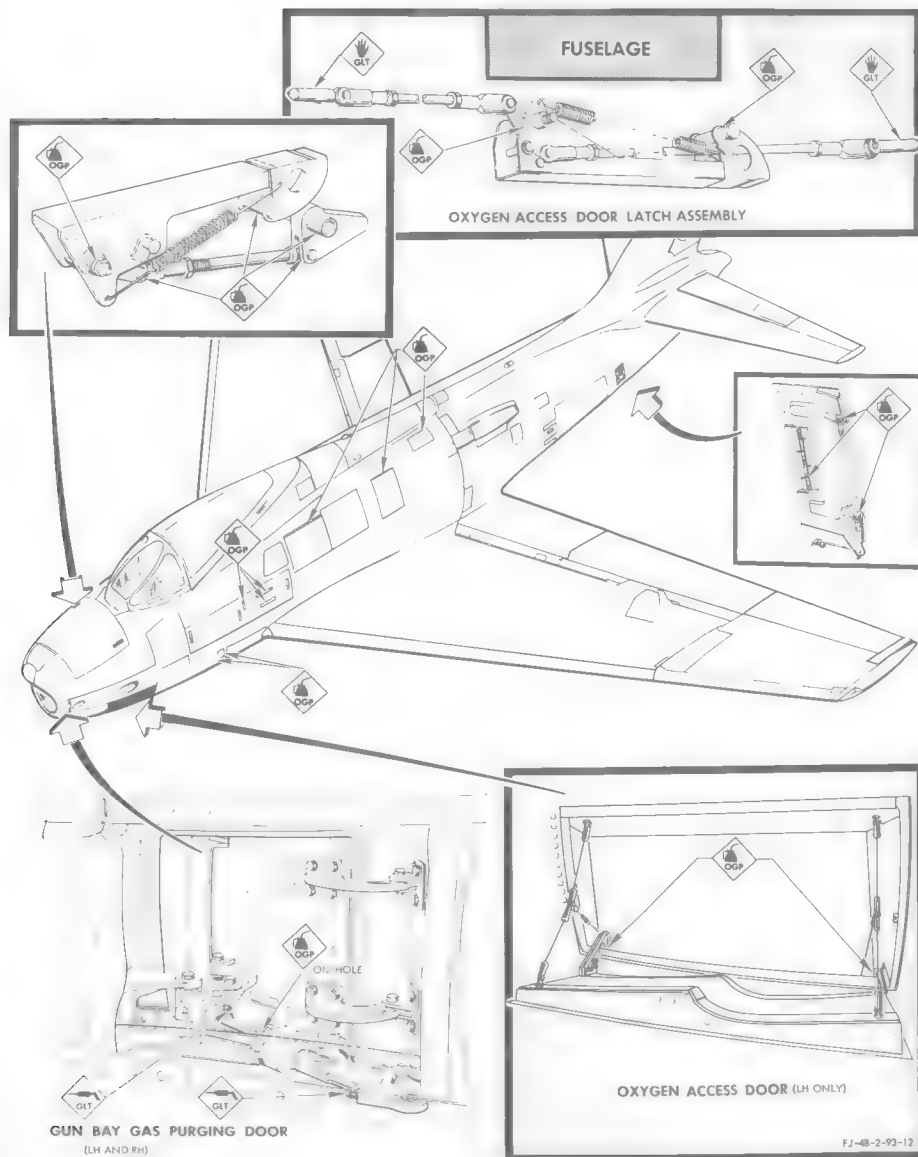


Figure No. 1-17. Lubrication Chart (Sheet 9)

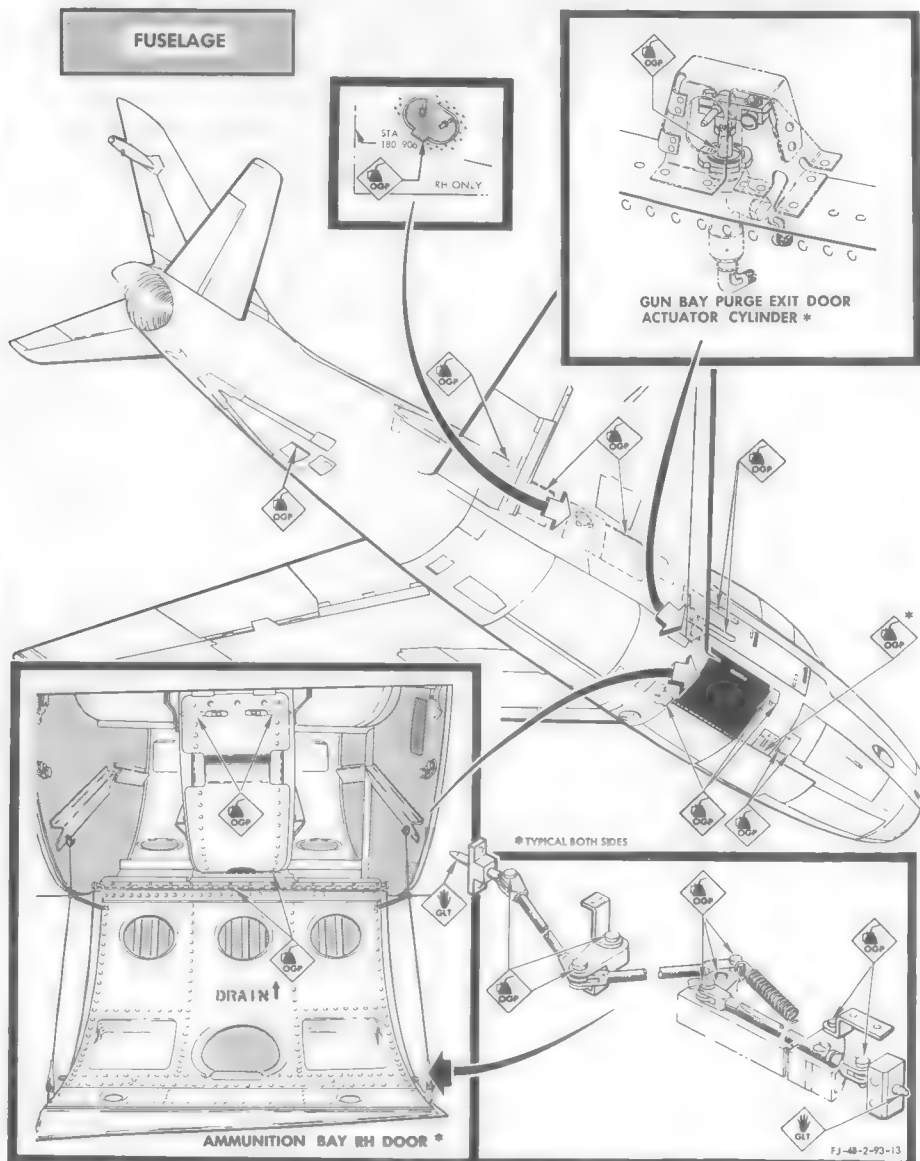


Figure No. 1-17. Lubrication Chart (Sheet 10)

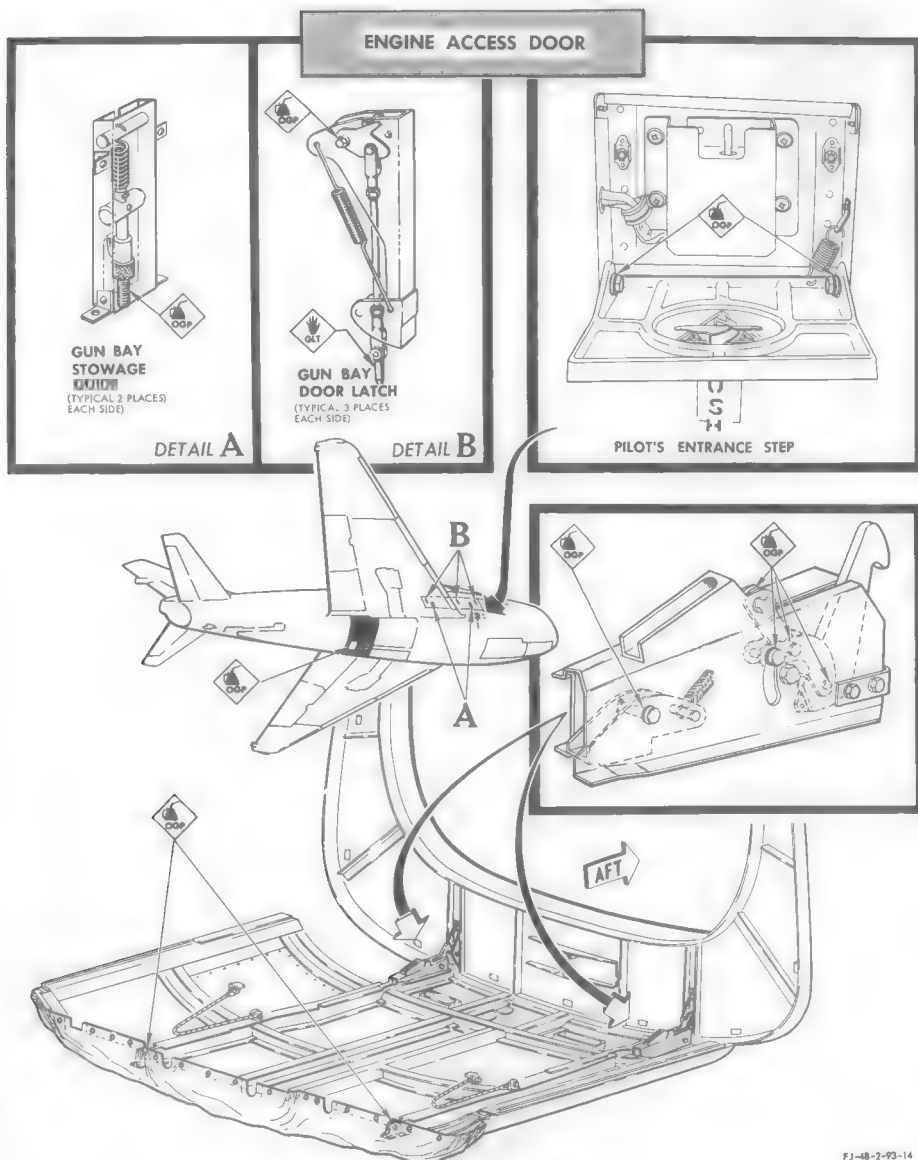


Figure No. 1-17. Lubrication Chart (Sheet 11)

FJ-48-2-93-14



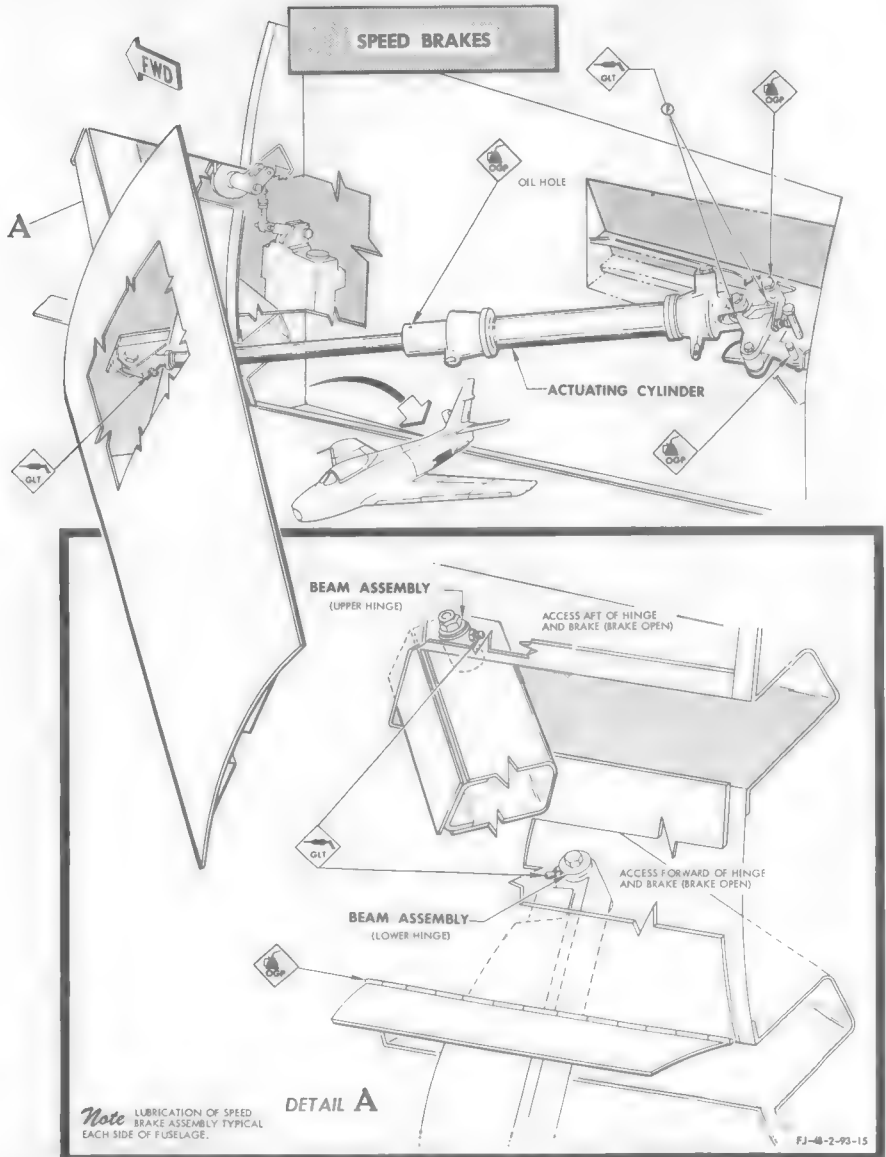


Figure No. 1-17. Lubrication Chart (Sheet 12)

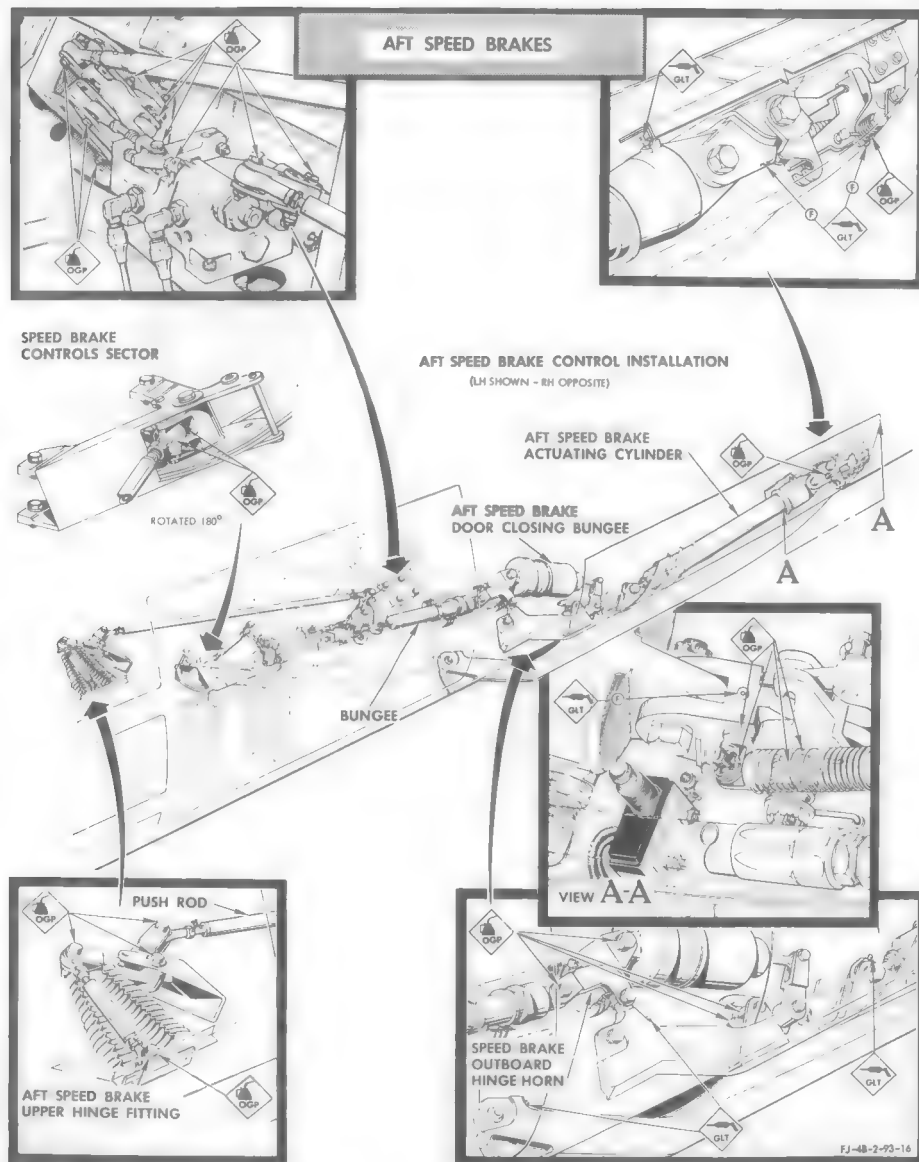


Figure No. 1-17. Lubrication Chart (Sheet 13)

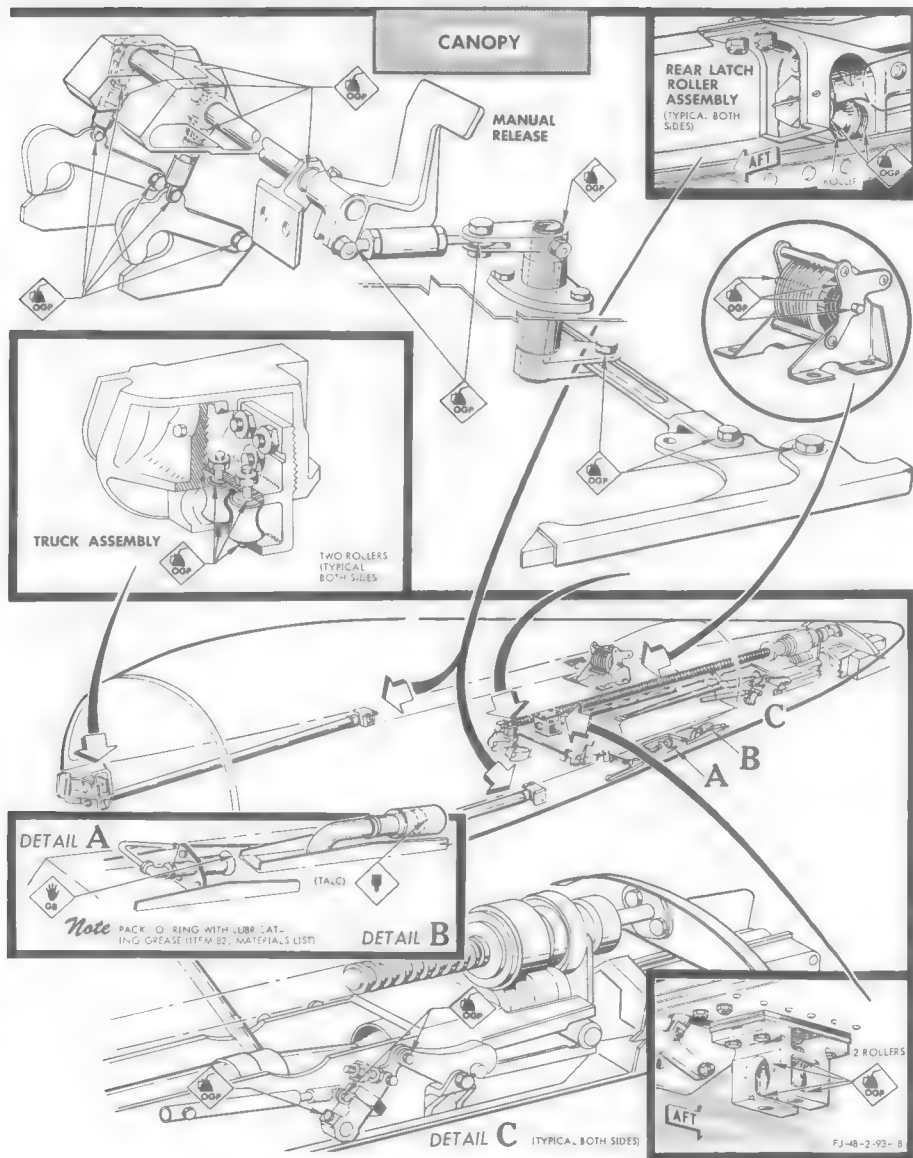


Figure No. 1-17. Lubrication Chart (Sheet 14)

A technical diagram of a mechanical assembly, possibly a vehicle chassis or engine component. Four callouts, each labeled 'GGP' inside a diamond shape, point to specific parts: the top left pivot, the top right pivot, the central pivot, and the bottom left pivot.

**Warning** BE CERTAIN THAT FLAGGED SAFETY PIN IS INSTALLED.

### PILOT'S EJECTION SEAT

PILOT'S EJECTION  
SEAT CATAPULT RELEASE

\* SAME BOTH SIDES

**Figure No. 1-17. Lubrication Chart (Sheet 15)**

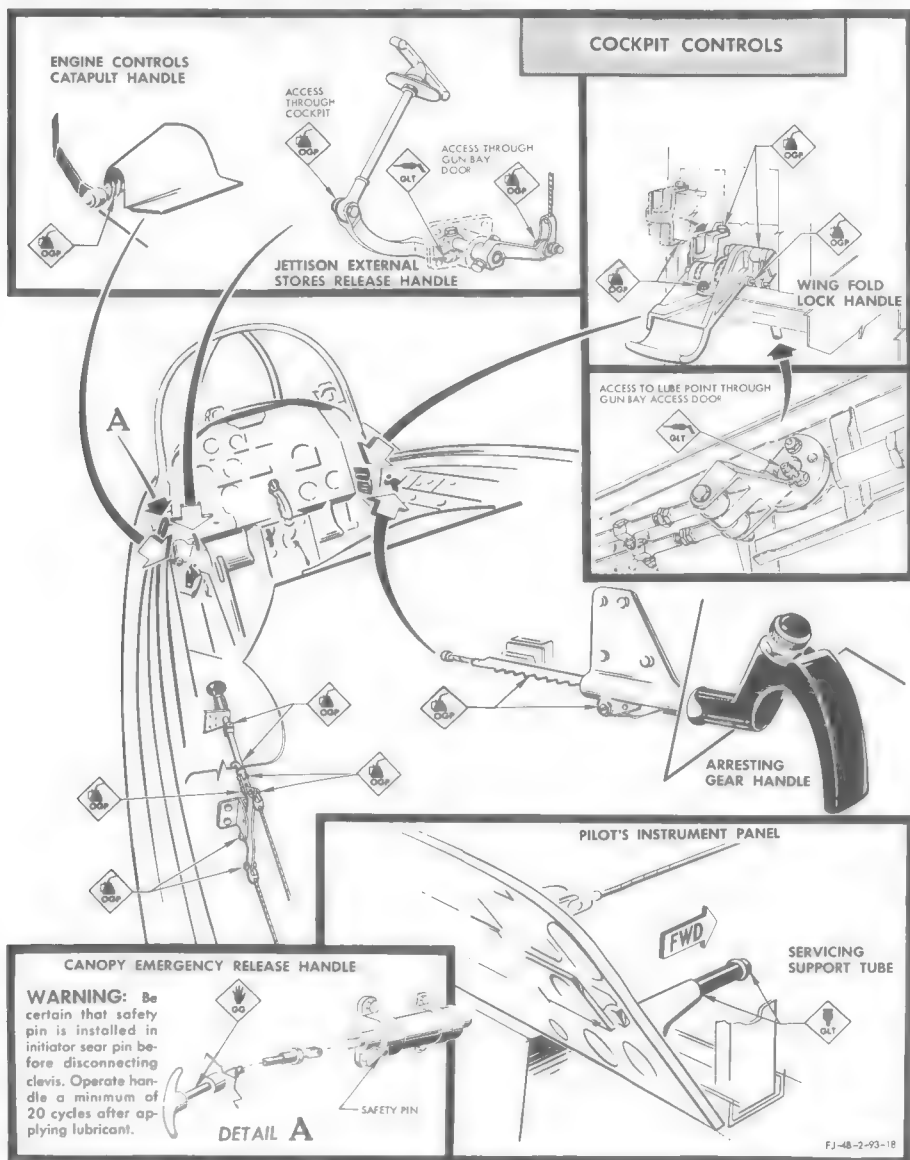
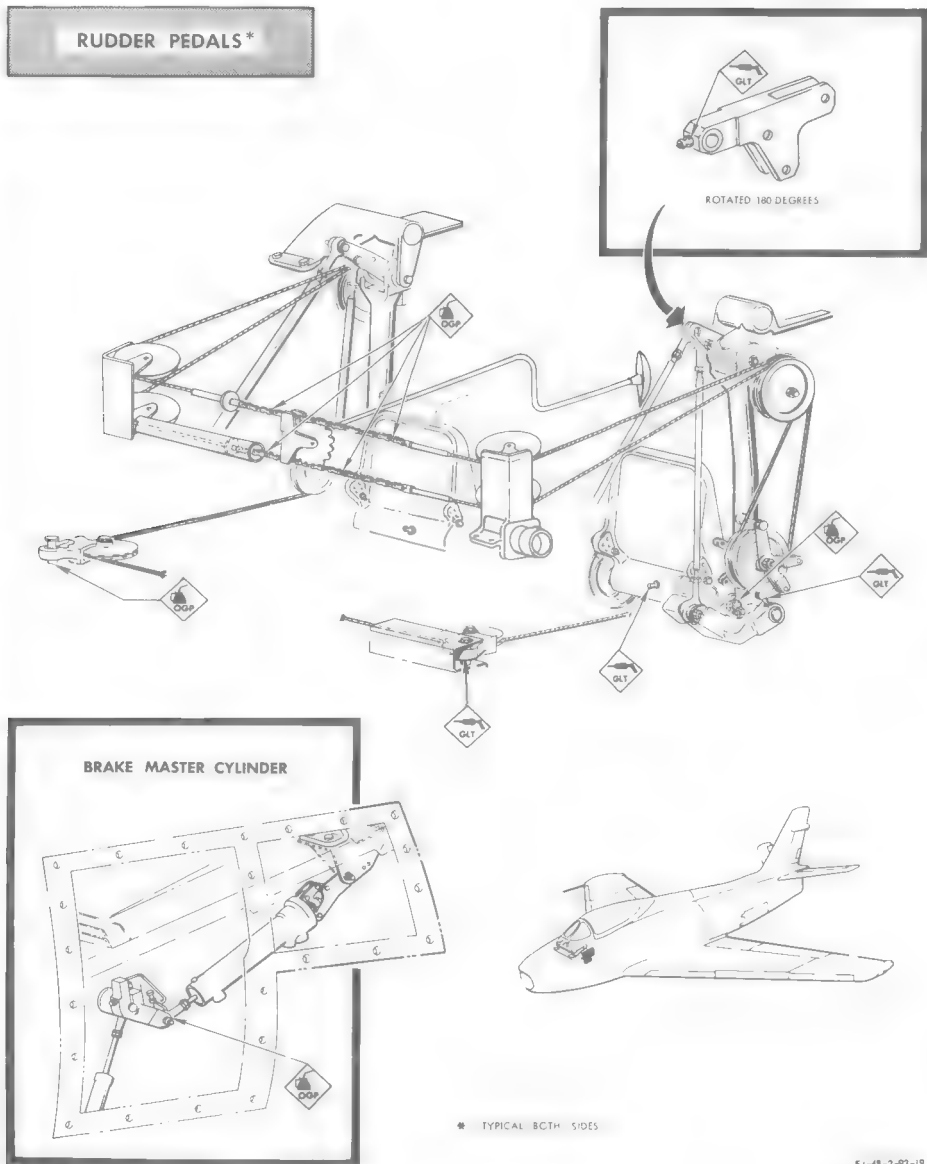


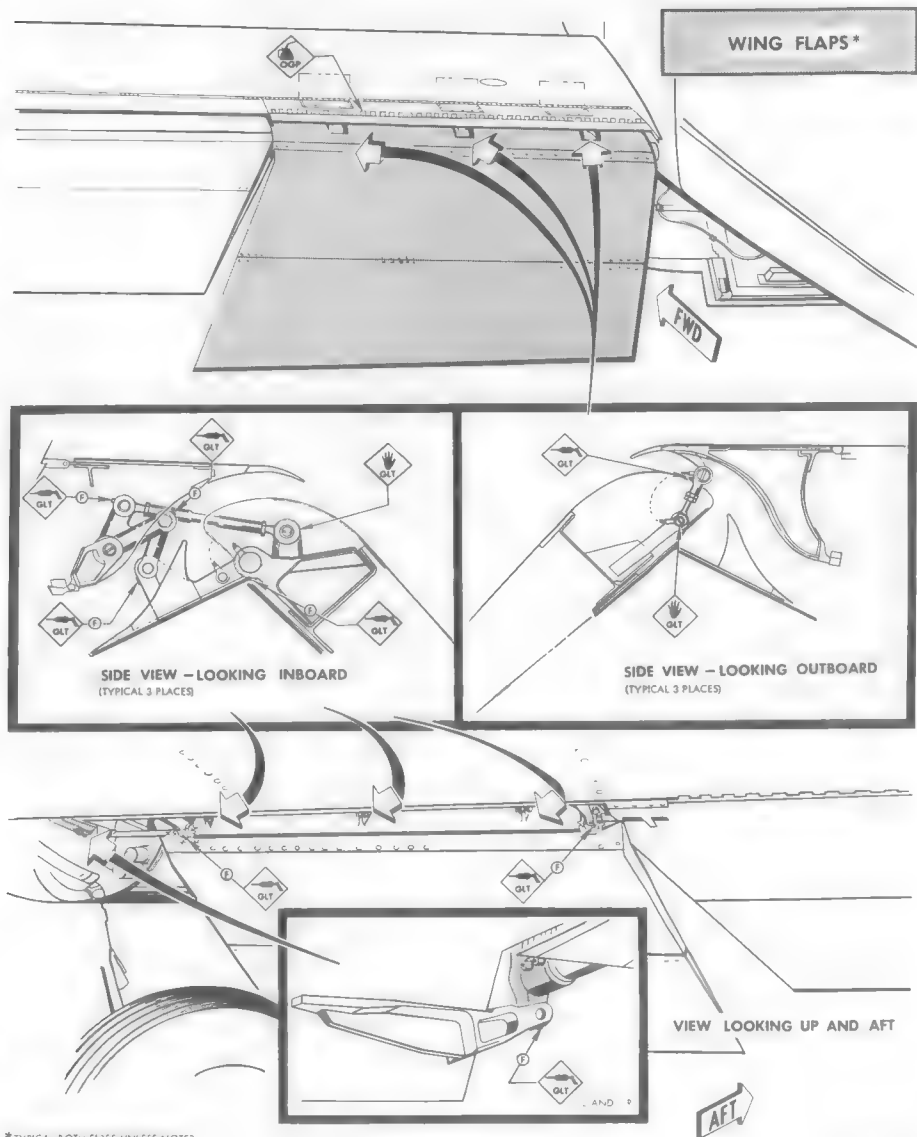
Figure No. 1-17. Lubrication Chart (Sheet 16)

RUDDER PEDALS\*



FJ-48-2-93-19

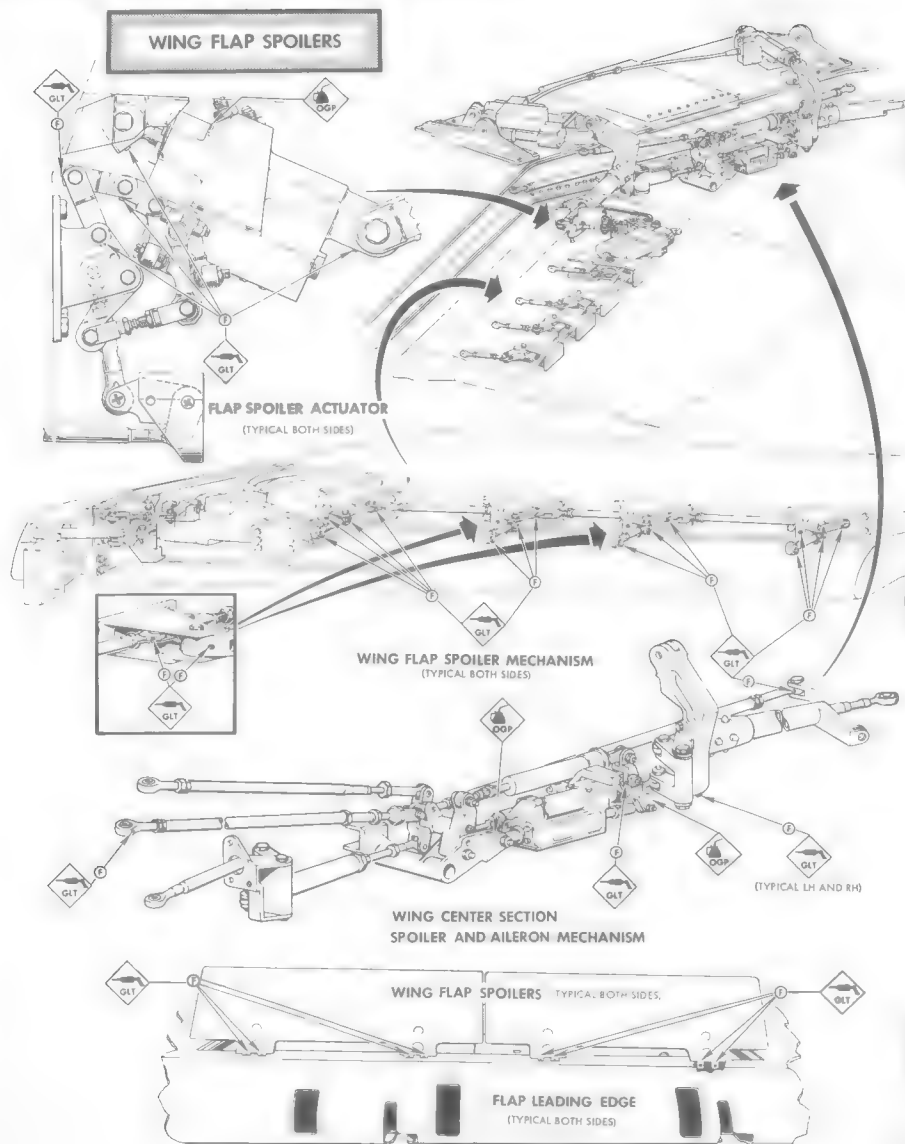
Figure No. 1-17. Lubrication Chart (Sheet 17)



\*TYPICAL, BOTH SIDES UNLESS NOTED

FJ-48-2-93-20

Figure No. 1-17. Lubrication Chart (Sheet 18)

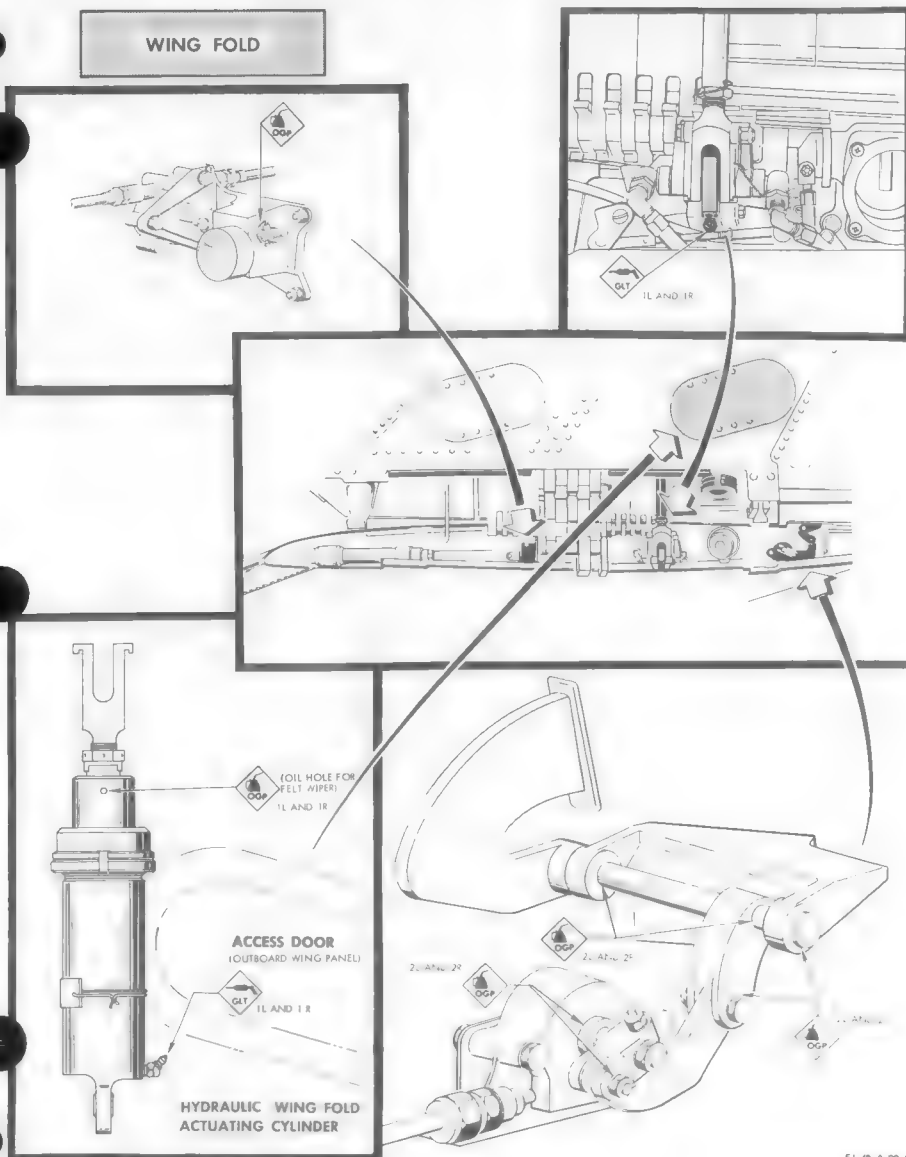


FJ-48-2-93-2A

Figure No. 1-17. Lubrication Chart (Sheet 19)



## WING FOLD



FJ-48-2-93-21

Figure No. 1-17, Lubrication Chart (Sheet 20)

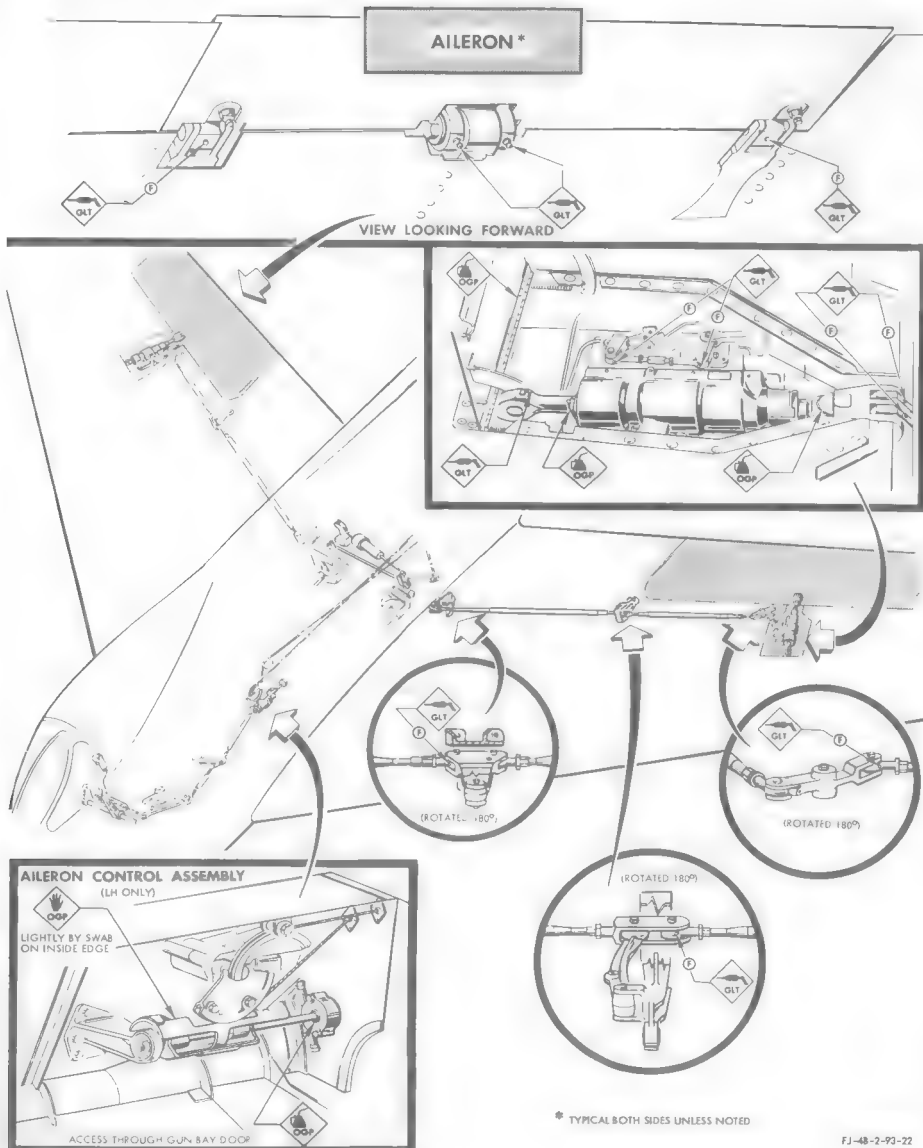


Figure No. 1-17. Lubrication Chart (Sheet 21)

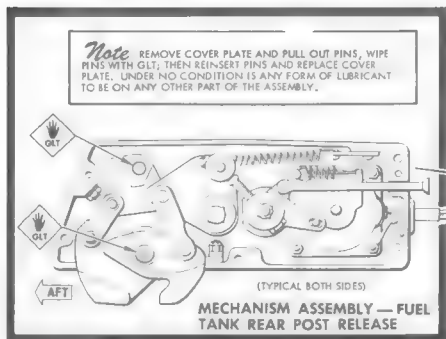
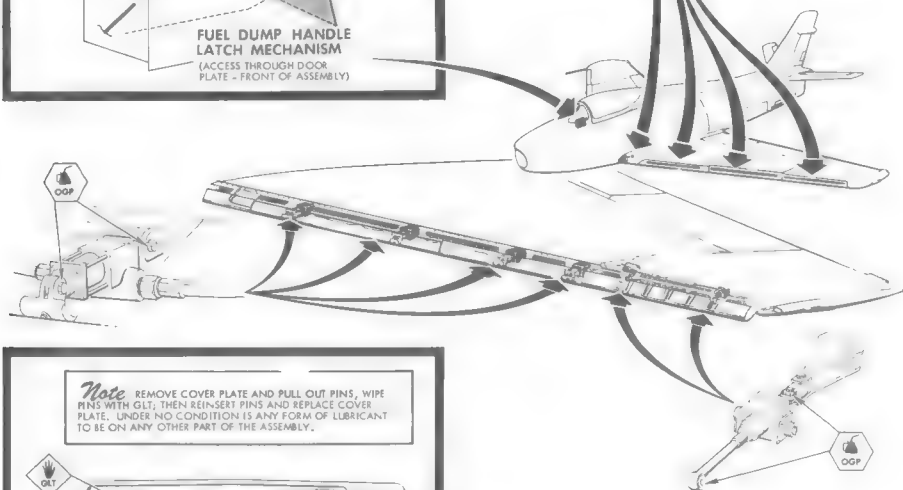
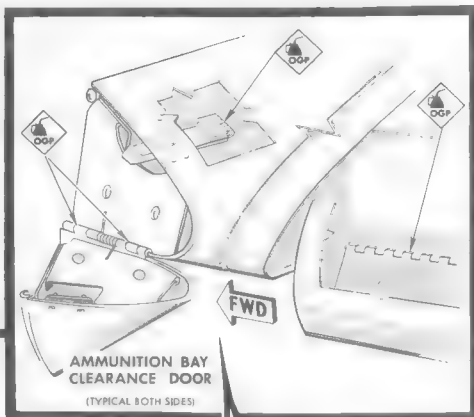
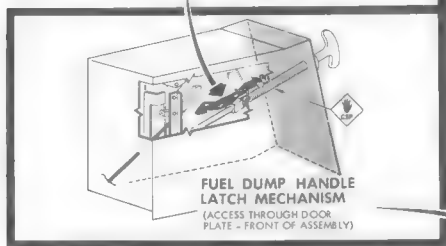
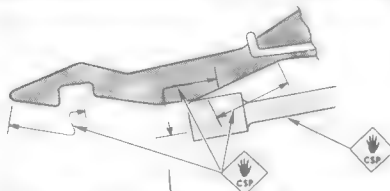
WING LEADING EDGE AND  
DROP TANK RELEASE

Figure No. 1-17. Lubrication Chart (Sheet 22)

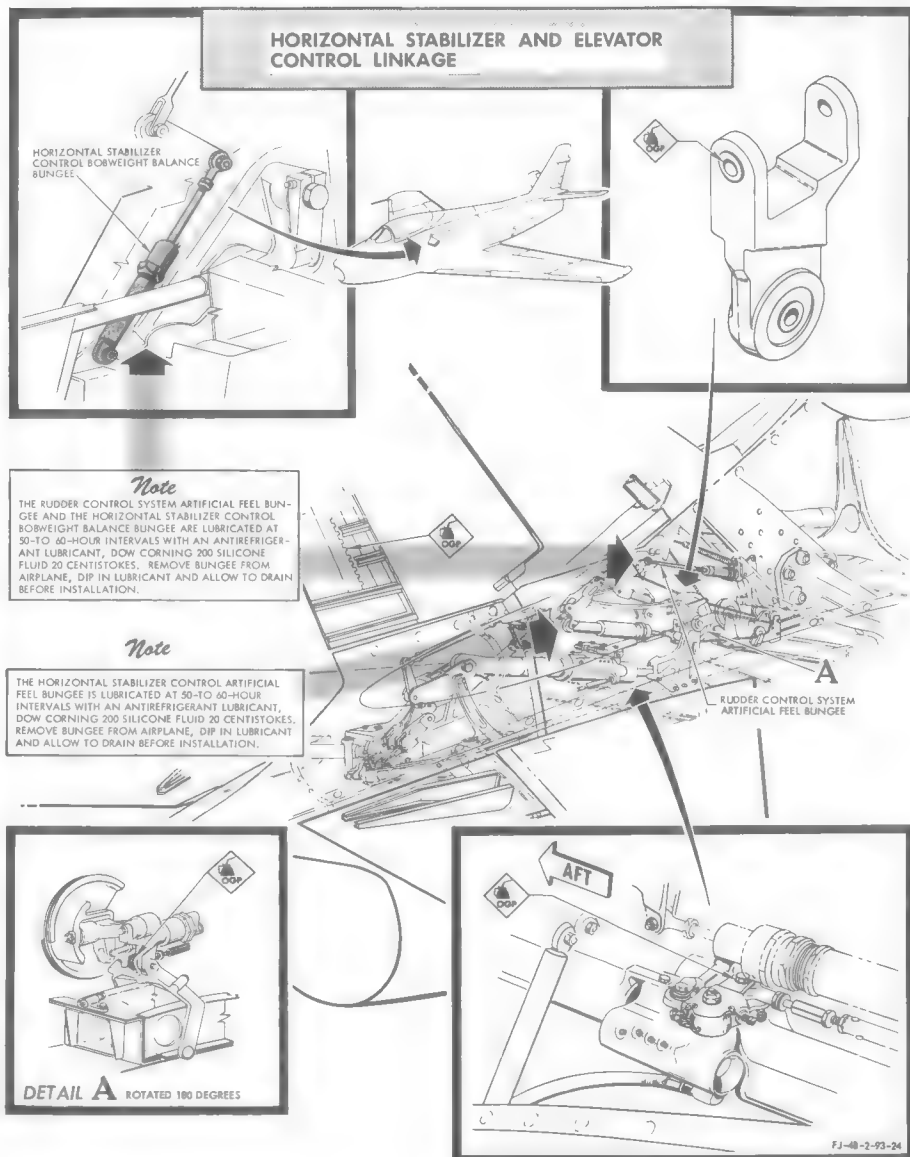
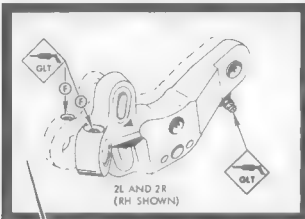
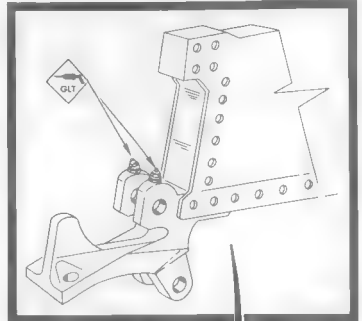
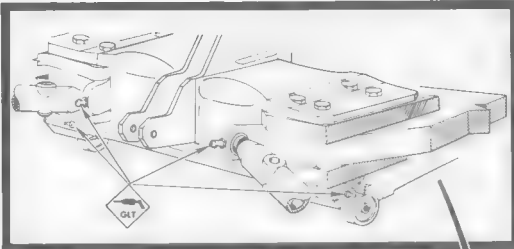
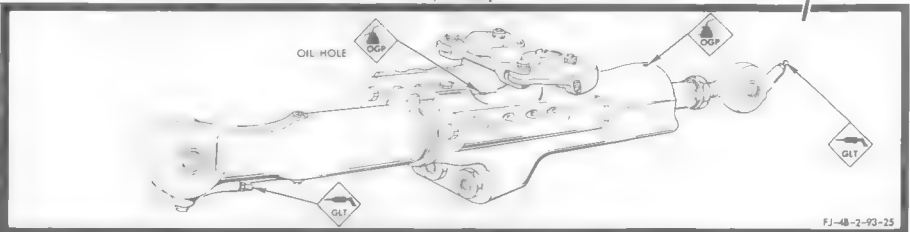
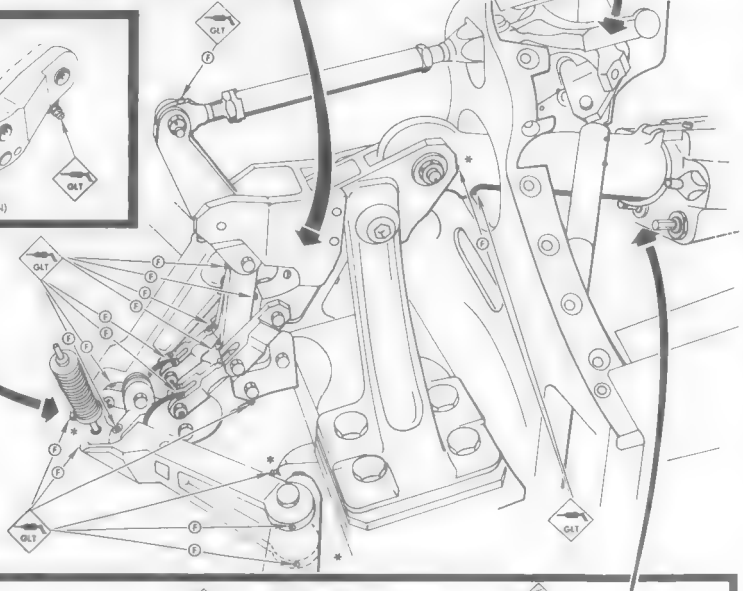


Figure No. 1-17. Lubrication Chart (Sheet 23)

**HORIZONTAL STABILIZER AND ELEVATOR  
CONTROL LINKAGE**

\* TYPICAL BOTH SIDES



FJ-48-2-V3-25

Figure No. 1-17. Lubrication Chart (Sheet 24)

RAM-AIR TURBINE RELEASE

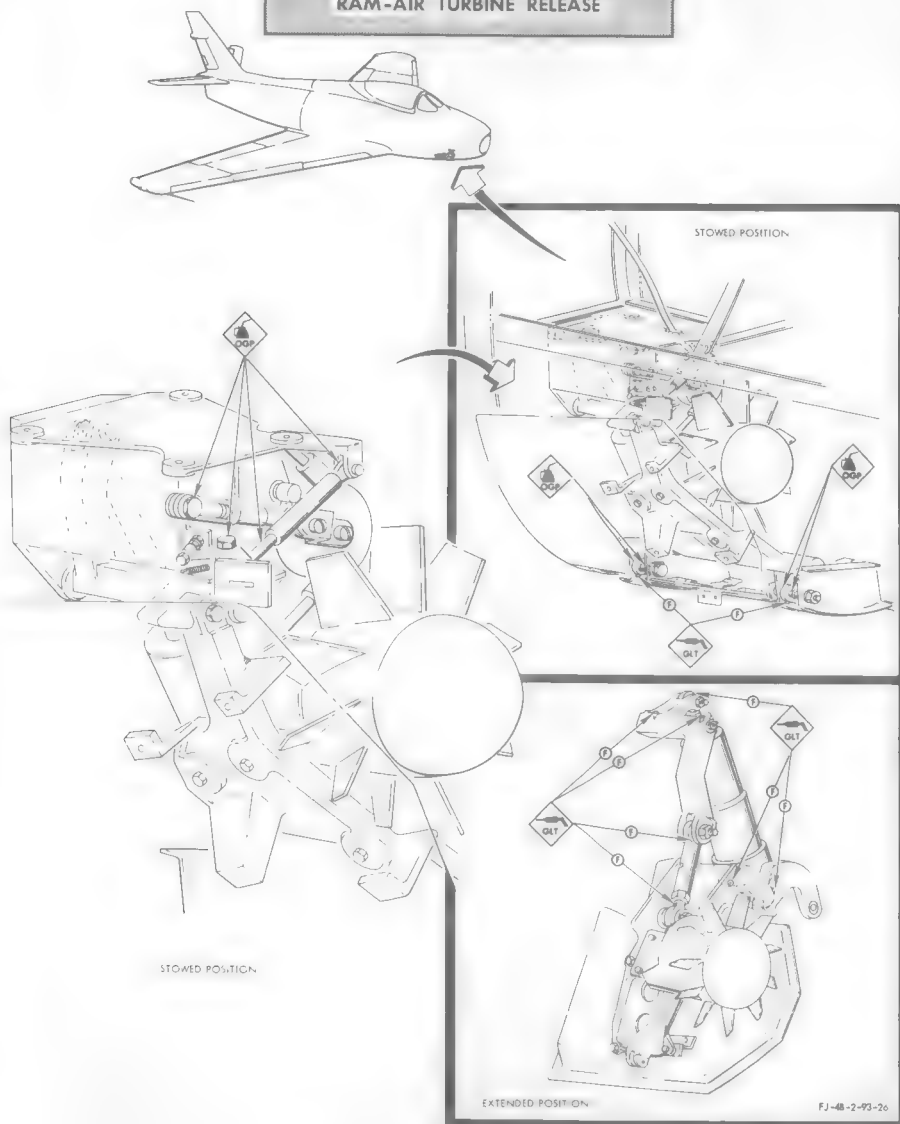


Figure No. 1-17. Lubrication Chart (Sheet 25)

**CLEANING****1-55. CLEANING.**

1-56. The importance of cleaning the airplane and keeping it clean cannot be overemphasized. For example, a cracked landing gear fitting covered with dirt and grease may be easily overlooked. Dirt can hide cracks in the skin. Loose nuts may cause hinge fittings to wear excessively. A film of dirt left on the airplane's outer surface reduces flying speed. Dirt, trash or loose gear bouncing around inside the airplane is annoying and dangerous. Small pieces of dirt or trash blown into the eyes of the pilot at a critical moment can be hazardous. A coating of dirt and grease on moving parts forms an abrasive that can cause excessive wear. Salt water has a serious corroding effect on exposed metal parts of the airplane and should, therefore, be washed off immediately. Indentations in the metal that harbor corrosion and involve laborious cleaning procedures may be prevented by following the procedures listed:

- a. Clean airplane at regular intervals. Consider cleaning as a maintenance and inspection practice.
- b. Use only approved materials and use these materials only as directed.
- c. Protect airplane at all times when it is on the ground by utilizing plugs and covers and safe parking areas.
- d. Avoid damage to airplane surfaces by careless practices during servicing and maintenance.
- e. Protect electrical equipment, instruments, non-metallic materials, etc, when cleaning airplane.
- f. Do not use screwdrivers to pry open access doors.
- g. Do not lean against or platforms against airplane unless they are padded.
- h. Protect airplane skin with working mats when maintenance is being performed.
- i. Perform immediate repair on surface dents. Maintain a close examination for corrosion and structural breaks. Report all discrepancies.
- j. Do not experiment with cleaning procedures and corrosion control. Only qualified personnel should accomplish this work.

**WARNING**

Solvents of any nature or percent of concentration are not to be used in an area of the airplane where they could come into contact with the forward fuel cell either by direct contact or by leakage into the fuel cell bay. The cell is self-sealing and accumulation of solvent could cause activation.

**1-57. PREPARING AIRPLANE FOR CLEANING.**

1-58. Before cleaning airplane, proceed as follows:

- a. If possible, park airplane in the shade or beneath an overhead shelter. In high temperatures or direct sunlight, cool surfaces to be cleaned by spraying with cool water.
- b. Ground airplane.
- c. If complete airplane is to be cleaned, make sure canopy is closed tight.
- d. Close all access doors and covers.
- e. Remove battery for complete airplane cleaning. If small areas are to be cleaned, disconnect battery.
- f. Mask or otherwise protect all radio and electrical equipment and any other equipment which could be damaged by moisture.
- g. To start and finish cleaning through a planned operation, have all necessary materials and equipment at hand.

**1-59. NORMAL METHOD FOR  
CLEANING EXTERIOR SURFACES  
OF PAINTED AIRPLANES.**

1-60. For normal cleaning of exterior surfaces, proceed as follows:

- a. Prepare airplane for cleaning as outlined in paragraph 1-57.
- b. Prepare a cleaning solution by adding a small amount (not to exceed 4 ounces to one gallon) of cleaning compound (item 24, materials list) to clean water.

**Note**

Cleaning compound (item 24, materials list) is not harmful to plastics, rubber, leather or fabric.

- c. Wet down surface to be washed with clean water.
- d. Wash airplane with a soft sponge or cheesecloth. The nonspecular finish should never be scrubbed with a rough cloth or hard bristle brush.

**CAUTION**

Personnel should use every precaution against slipping or falling. Make sure guard rails are installed when using maintenance stands.

- e. Immediately rinse off solution with clean water while washing airplane. Be certain that all cleaning compound is removed from joints, recesses and other possible places of collection.

**Note**

If cleaning compound has removed any lubricant from bearing or sliding surfaces, relubricate with applicable oil or grease.

**1-61. ALTERNATE METHODS FOR  
CLEANING EXTERIOR SURFACES  
OF PAINTED AIRPLANES.**

1-62. The alternate methods for cleaning exterior surfaces are accomplished by the use of an emulsion solvent or by steam spray.

**I. STEAM CLEANING**—In order to remove light deposits of oil, mud, dirt and grease from the airplane, the steam cleaning method is recommended, provided the proper precautions are taken.

**CAUTION**

- Do not steam clean components of honeycomb sandwich-type construction; this includes such areas as the ailerons, flaps, elevators and the trailing edge of the outboard wing.
- Steam will soften and loosen paint if the gun is not held at least a foot away from the painted surface.
- Steam cleaning demands particular attention in the protection of the airplane by covering and masking and by careful direction of the steam spray. Parts such as microswitches, junction boxes and other electrical equipment must be masked or covered to prevent entrance of moisture from steam. Plastics and other materials that could be damaged by the heat of steam should be suitably protected.

a. Prepare airplane for cleaning as outlined in paragraph 1-57.

b. Mix a solution of 1 to 2 ounces of steam cleaning compound (item 25, materials list) with each gallon of water.

c. Operate the steam jenny according to the instructions which appear on the equipment name plate.

**Note**

- If the cleaner in the container is lumpy due to moisture, break up the lumps as small as possible and add the water to the cleaner. Never add the cleaner to the water.
- Arrange the work so that the steam cleaning compound can be rinsed off with water before compound dries on the airplane. Hot water is preferred for rinsing off the steam cleaning solution.

**II. EMULSION CLEANING**—To clean areas heavily contaminated with grease, oil, etc, which cannot be easily cleaned by other methods, an emulsion-type cleaner may be used. The following procedure is suggested:

a. Prepare airplane for cleaning as outlined in paragraph 1-57.

b. Mix one part of Type I solvent emulsion grease-cleaning compound (item 29, materials list) with four to nine parts of kerosene.

**CAUTION**

- Solvent emulsion grease-cleaning compound will remove hard and soft film corrosion preventive coatings such as cosmoline and should not be used on areas so protected.

- Type I solvent emulsion grease (item 29, materials list) should be used instead of Type II for normal cleaning because of reduced paint softening action.

c. Wet down areas to be washed with warm water.

d. Cover area with cleaner and allow cleaner to remain on the surface for 5 to 10 minutes. Cleaner can be sprayed, swabbed or brushed on the area to be cleaned.

e. Rinse the area with high-pressure hot or cold water until all soil deposits are free.

f. Wipe or air dry.

**1-63. CLEANING LIGHT TO MEDIUM  
DEPOSITS OF DIRT AND GREASE  
ON PAINTED AIRPLANES.**

1-64. To clean light to medium deposits of dirt and grease from the exterior surfaces of the airplane, proceed as follows:

a. Prepare and clean the airplane according to the instructions for normal or alternate washing. (Refer to paragraphs 1-59 and 1-61.)

**Note**

The alternate method is slightly more effective for the removal of medium deposits.

b. After airplane has been thoroughly rinsed and dried, apply "spray glaze" heavy duty cleaner (item 18, materials list) or a comparable approved product.

**1-65. CLEANING MEDIUM TO HEAVY  
DEPOSITS OF DIRT AND GREASE  
ON PAINTED AIRPLANES.**

1-66. To clean medium to heavy deposits of dirt, grease, minor corrosion and other accumulations from the exterior surfaces of painted airplanes, proceed as follows:

a. Prepare and clean the airplane by using recommended normal or alternate cleaning methods (paragraphs 1-59 and 1-61). Rinse thoroughly with clean water and air dry.

b. After cleaning, check surfaces closely for defects and evidence of surface deterioration.

c. Treat the surfaces exposed to gun blast acid spillage and other corrosion receptive areas by removing all contamination with "spray glaze" heavy duty cleaner (item 18, materials list) or a comparable approved product.



d. Again clean these areas as indicated in paragraph 1-59.

e. If contaminations are still present, then it is necessary to strip the paint completely in the defective area and rebuild the surface. The complete touch-up painting procedure (paragraph 1-75) should be followed.

### CAUTION

Do not under any circumstances apply any type of wax to the glossy or nonspecular finishes on this airplane.

#### 1-67. CLEANING AIRPLANE INTERIOR.

1-68. Keeping the interior of the airplane clean is as important as maintaining a clean exterior surface. Corrosion can establish itself on the inside structure to a greater degree because of inaccessibility. Nuts, bolts, bits of wire or other metal objects carelessly dropped and neglected, combined with moisture and dissimilar metal contact, can cause electrolytic corrosion. Care should be taken during servicing and maintenance and a daily check made for cockpit cleanliness. Immediately clean up any liquid spillage. Do not overflow scupper drains. Keep all drains open. See that skin and structure is not scarred by tools and other metal objects. Correct small leaks in fluid systems and do not let water or other liquids pool in the low parts of the airplane where they could contaminate the systems, be a fire hazard or form a bridge for dissimilar metal contact. To clean the interior of the airplane, a vacuum cleaner can be used to pick up dust and debris. In some places, air pressure can be used advantageously, but this should be done with extreme caution since dirt and dust may be blown into the inside of sensitive instruments and equipment, or scatter minute metal particles into inaccessible places. Use only light duty cleaners on the inside of the airplane. Moisten a cloth with cleaning agent and dab lightly. Where light duty cleaners are ineffective, Stoddard Solvent (item 119, materials list) or kerosene can be used with discretion.

### WARNING

Solvents and chemical compounds must not be used in areas where any excess may gather in the forward fuselage fuel cell bay. This is a self-sealing cell and is subject to external activation by solvents and compounds.

#### 1-69. CARE OF LANDING GEAR AND TIRES.

1-70. Landing gear structural members should have rust or corrosion removed as soon as it is detected. Because of heavy compression loads, landing equipment should be checked for structural fatigue after each hard landing. Investigate any flaking or cracking of paint. Always examine the sliding surfaces for scratches and pitting which could cause leaks, contaminate a system or

jam a mechanism. Blot off any dirt that collects on these sliding surfaces with a clean cloth. Do not rub off foreign material with the cloth because of the possibility of scratching the highly polished surface. Relubricate the surface with hydraulic fluid (item 95, materials list). Since cleaning often will remove the lubricating fluid from these surfaces, it is advisable to relubricate after airplane cleaning. Do not allow grease, oil or other chemicals to remain on tires. Wash off tires immediately with a mild soap solution or by wiping with a cloth moistened with Stoddard Solvent (item 119, materials list) or naphtha (item 91, materials list). When towing or moving the airplane, avoid rolling the tires over spilled servicing fluids. Cover the tires during cleaning and painting operations and also when performing maintenance work involving oil or grease leakage. Insulate the tires by placing some sort of material (wood or heavy paper) between them and a harmful surface such as salt, coral or ice.

#### 1-71. CARE OF ELECTRICAL EQUIPMENT.

1-72. Corrosion can seriously affect electrical equipment and should be removed immediately upon discovery. Once corrosion is detected on one unit during normal inspection, it is wise to check other equipment such as cables, bonding and connectors for damage from corrosion. When any amount of corrosion is found on any electrical equipment such as plugs and terminal strips, it can be removed with a fiber brush and a small amount of ethyl alcohol (item 6, materials list), or other noncorrosive solvent. Adequate ventilation is required for most solvents. Cleaned equipment must be completely dry before applying electrical power. Fine emery cloth may be used to clean the terminals or mating surfaces when corroded or dirty. Crocus cloth or a very fine sandpaper should be used to clean commutators or slip rings. Emery cloth should never be used to clean commutators. Portable vacuum cleaners should be used very carefully to remove dust. Stoddard Solvent can be used to remove hydraulic fluid from electrical wiring if the wiring cannot be satisfactorily cleaned with dry cloths. Separate and wipe wires individually, if possible. Use Stoddard Solvent with care since it may remove identification markings.

#### 1-73. CLEANING ACRYLIC PLASTIC CANOPIES.

1-74. Keeping the canopy glass clean is of utmost importance. Procedures for proper cleaning of the exterior and interior surfaces are listed as follows:

##### I. EXTERIOR SURFACES.

- Remove loose dust and residues with compressed air when available.
- Flush with plenty of clean fresh water, using the bare hand gently to feel and dislodge any dirt, salt, mud or particles.

### CAUTION

Remove rings or other hard objects from hand before washing transparent plastics.

c. Wash gently with soap and water only. The water must be free of dirt or abrasive materials. Go over the surface with the bare hand only to seek out and carefully dislodge any dirt or particles. A clean sponge may be used to carry the soap and water to the plastic, but not for scrubbing or washing.

d. Dry with a clean damp chamois (item 143, materials list). Blot to dry. Do not rub.

e. Remove oil and grease residues by applying cleaning and polishing compound, transparent plastic aircraft materials (item 32, materials list) with a soft clean cloth.

#### CAUTION

Do not use any of the following materials for cleaning or permit their fumes to contact transparent aircraft materials: gasoline, alcohol, benzene, toluene, hexane, kerosene, xylene, ketones, including acetone, carbon tetrachloride, fire extinguisher or de-icing fluids, dope or lacquer thinners, window cleaning sprays, trichlorethylene, perchloroethylene, paint stripping compounds, degreasing compounds or other than specifically authorized cleaning and polishing compounds. These materials can soften the plastic and cause crazing.

f. If, after removing dirt and grease, the plastic surface is found marred by light scratches, restore the polished surface by repeating the application of compound (item 32, materials list) and polishing by hand. Several applications may be necessary.

g. If deep scratches exist, they should be removed by the procedures described in Engineering Handbook,

#### Maintenance and Repair of Transparent Plastics (AN 01-1A-12).

#### CAUTION

Do not attempt polishing until the surface is thoroughly clean. If dirt or grit is present, it may cause more serious damage than the original scratches. Power buffing should only be used in accordance with the procedures of Engineering Handbook (AN 01-1A-12).

h. Cloths used to apply cleaning and polishing compound should be soft and clean. Canton flannel (item 141, materials list), outing flannel (item 142, materials list), Type I, flannelette and diaper cloth are satisfactory. Cloths should be set aside for use only on transparent plastic surfaces and kept in closed containers or in protected rolls to keep them clean and grit-free. Do not rub plastic surfaces with a dry cloth since this is not only likely to cause scratches but also builds up an electrostatic charge which attracts dust particles to the surface.

#### II. INTERIOR SURFACES.

a. Dust the plastic surfaces lightly with a soft clean cloth. Do not wipe the surface with a dry cloth.

b. Wipe carefully with a soft damp cloth or sponge. Keep the cloth or sponge free from soil and grit by rinsing it frequently in clean water.

III. Personnel should refer to Engineering Handbook (AN 01-1A-12) for applicable procedures on the repair, maintenance and refinishing of transparent plastic materials.

## TOUCH-UP PAINTING OF EXTERIOR SURFACES

### 1-75. TOUCH-UP PAINTING OF EXTERIOR SURFACES.

1-76. Touch-up painting is one of the most neglected phases of aircraft maintenance, partly because of an unawareness of the importance of the paint finish and partly because of a hesitation of tackling a job that requires such patient preparation to correct a seemingly minor discrepancy. Touch-up painting has some very vital considerations. It is much more practical to touch up a series of airplanes than to do complete airplane repainting at a later date. The instructions given here are not necessarily for the beginner or the expert; they are for the man who has had some experience in, and a working knowledge of, aircraft painting. Painting is critical on airplanes. Haphazard application of paint could result in many dangerous situations such as hiding weak or damaged skin or structure, permitting the build-up of strong electrostatic charges, binding or locking of flight or system controls and disturbing designed flight

characteristics. Large area and complete panel repainting involves many special procedures and is beyond the scope of this handbook. Touch-up painting on small areas can, however, be done with a minimum of painting equipment. Each step in the touching-up process is important. New finish paint cannot be applied over old primer since the primer will excessively harden from exposure to air and the finish coat will not adhere. Bare metals must be re-treated chemically because paint stripping compounds will remove the original chemical corrosion-resisting treatment. Untreated metal is highly susceptible to corrosion. Also, paint will not adhere to a surface that has not been chemically treated. Before any part of the touch-up painting methods are begun, it is imperative that all of the special requirements (paragraph 1-83) be studied. These special requirements will govern all procedures, and it is not advisable to attempt work that is in conflict with the listed restrictions. For information on the proper finish materials to be used on the various localities of the airplane, see figure 1-18.

**CAUTION**

Because of the various drying times, touch-up painting should be planned so that full operation can be carried out within 24 hours. It is not advisable to undertake painting if the humidity in the area is 86 percent or above or if the temperature is below 21°C (70°F).

**Note**

For the purpose of simplicity, the following terms have been adopted. These terms may not be within their exact technical usage, but will help standardize meanings.

**CHEMICAL SURFACE TREATMENT (INORGANIC)**—Treating bare metal surfaces with a mild etching chemical to form a corrosion-resistant painting surface.

**PRIMING COATS (ORGANIC)**—A term encompassing the finish paint undercoats. This includes wash primer or metal pretreatment coating and zinc chromate primer.

**FINISH COATS (ORGANIC)**—The lacquer or enamel top coat or coats.

**Note**

Surface chemical film treatment is recommended for touch-up areas of more than 1/2 inch in width. This, of course, is an arbitrary figure. On areas less than 1/2-inch wide, remove the old paint, clean the surface and add the primer and finish paint coats.

**1-77. REMOVING PAINTS AND PRIMERS.**

1-78. This procedure is for use with water-rinsable, nonflammable paint remover (item 103, materials list). When removing old paints and primers, it is necessary to remove all traces of old film in the touch-up area. It is not acceptable to remove only the finish coat before touching up. This remover is recommended because of the elimination of the fire hazard. It has a relatively slow drying rate and is adaptable for outdoor use. Paint remover (item 103, materials list) is also effective in removing aged paint. Other approved paint removers will require approximately the same instructions and precautions. To remove paint, proceed as follows:

**CAUTION**

Paint stripping should be done outdoors if possible. If stripping is to be accomplished indoors, the hangar or room must be well ventilated. Paint removers have a high toxicity and are dangerous to handle. Personnel doing the removing should wear eyeglass-type goggles, rubber or synthetic rubber gloves and aprons and rubber boots.

**CAUTION**

Avoid excessive breathing of the vapors. If any of the remover is accidentally splashed on the skin, immediately wash off with a dilute solution of alcohol, followed by the application of glycerin, vaseline or petrolatum jelly.

a. Mask off all plastics (both transparent and non-transparent), rubber or other nonmetallic materials adjacent to the touch-up area. Tires should be placed on boards if there is a chance that the airplane will be moved or towed over any stripper that is spilled on the deck. Make certain that all access doors are securely fastened; mask off all joints and recesses. Mask off completely all holes where there is a possibility of the paint remover getting into internal areas or places not to be stripped. If working off the ground, arrange stands with safety devices to lessen the danger of slipping. Paint remover on the soles of rubber boots can make footing insecure. Protect the deck from drip and splash. Paint stripper will seriously deteriorate asphalt and asphaltic base materials. The fumes from paint strippers are injurious to plastic and doped fabric and, whenever possible, these materials should be removed from the area.

b. Thoroughly stir or agitate the paint remover. Pour the amount needed into a container. Do not fill too full because of the chance of spillage. Prepare to apply the stripper from the top down.

c. Apply a heavy coating of the stripper by brushing or swabbing. Allow to stand until the paint film is completely loosened. This usually requires 10 to 20 minutes.

d. Remove the loosened paint with a stiff bristle fiber brush or equivalent, or by pressure spraying with water. For most efficient removal, start at the bottom and work up. Small quantities of water tend to set up the stripper. Pressure spraying is usually not applicable to small areas but, if it is used, avoid splattering and rundown.

e. Reapply and remove stripper if the first application does not remove all of the paint and primer.

f. Rinse the surface thoroughly with clean water. Wash the area with cleaning compound (item 24, materials list). Rinse again with clean water and dry with a filtered air blast or cloths.









g. Make a thorough examination of the area to be certain that all of the paint stripper has been removed, particularly along joint lines, around rivets and in recesses. If any of the areas surrounding the touch-up area have been spotted, wash and dry completely. These areas may be touched up with the applicable finish material.

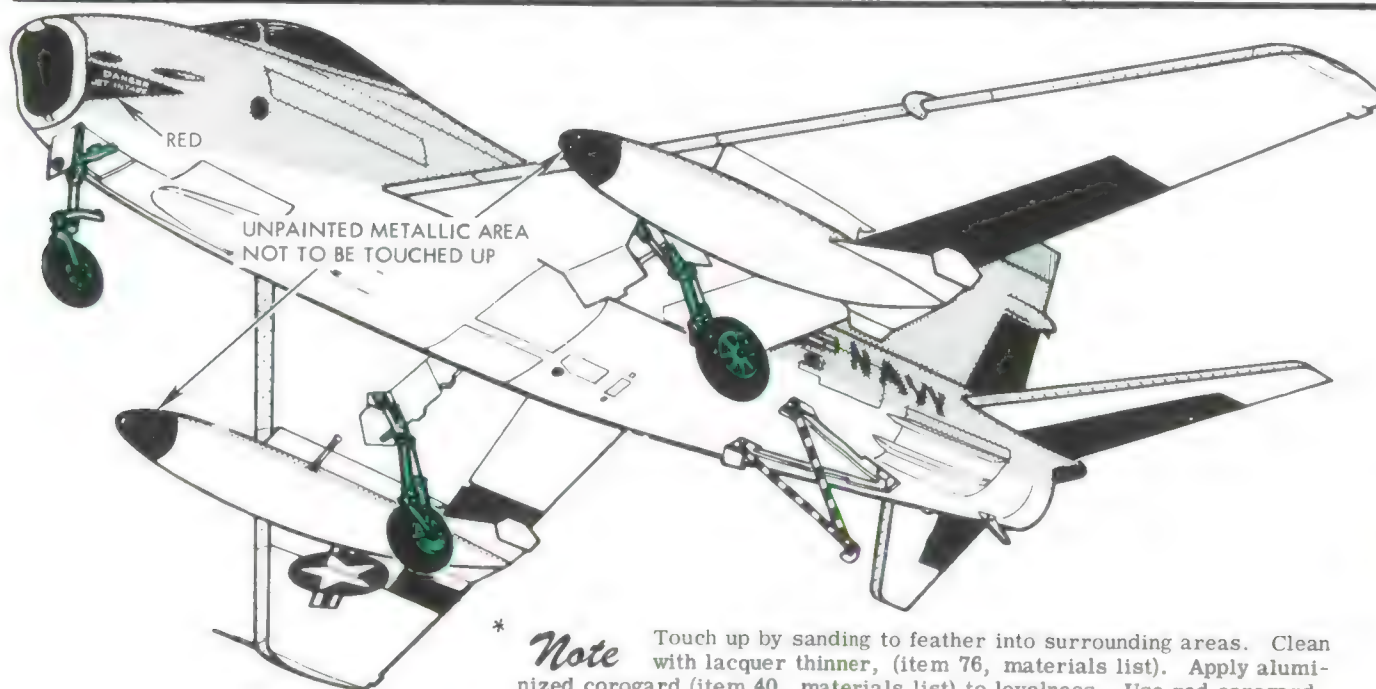
h. All corrosion must be removed at this point. Corrosion, no matter how slight, will continue to eat away at the metal even though it has been covered by paint films.



Section I  
Touch-up Painting

NAVAER 01-60JKE-502

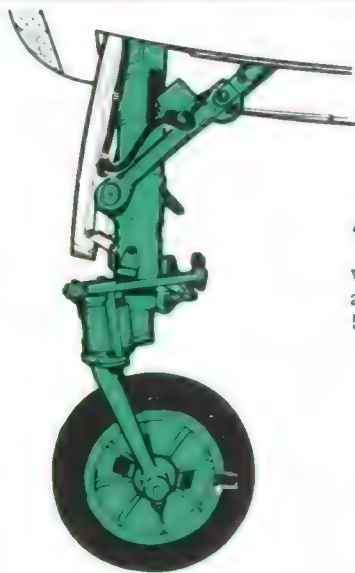
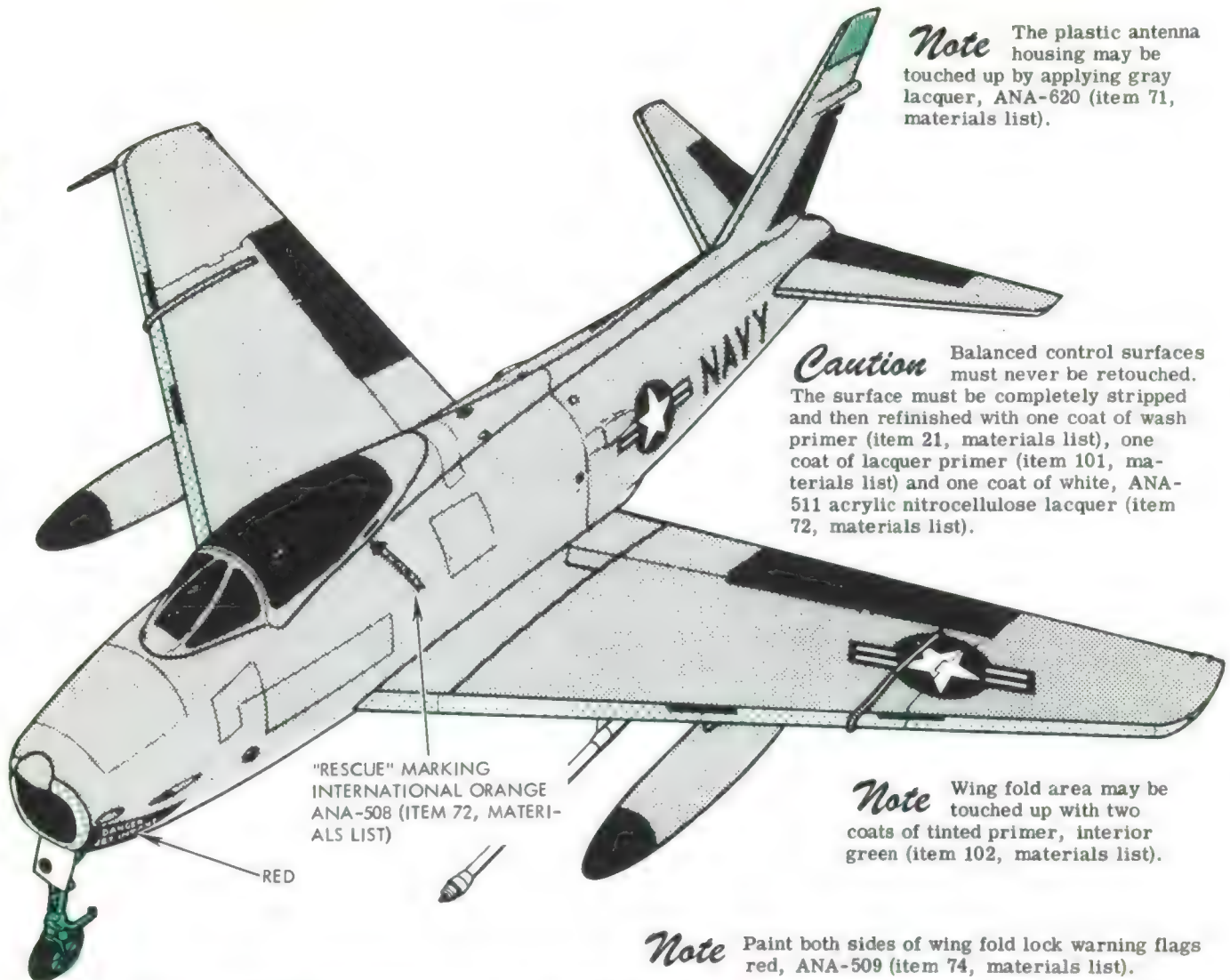
| SYMBOL  | ITEM   | COLOR   | MATERIAL  |
|---|--|---|---|
|    | NONMETALLIC, AERODYNAMICALLY SMOOTHED SURFACES, AIR PASSAGES, BALANCED CONTROL SURFACES AND FUNCTIONING PARTS  | NOT TO BE TOUCHED UP  | NOT TO BE TOUCHED UP  |
|    | LEADING EDGES OF AIRFOILS AND FRONTAL SURFACES   | ALUMINUM AND RED  | *SEE NOTE   |
|    | INSIGNIA   | INSIGNIA WHITE ANA-511<br>INSIGNIA RED ANA-509<br>INSIGNIA BLUE ANA-502   | 2 COATS GLOSSY LACQUER<br>(ITEM 72, MATERIALS LIST)   |
|   |  | INSIGNIA WHITE ANA-601<br>BRIGHT RED ANA-619<br>INSIGNIA BLUE ANA-605   | 2 COATS LUSTERLESS LACQUER<br>(ITEM 71, MATERIALS LIST)   |
|    | LANDING GEAR, SHOCK STRUTS, SIDE BRACES<br>DRAG BRACE AND WHEELS   | ALUMINUM  | 2 COATS ALUMINUM LACQUER<br>(ITEM 74, MATERIALS LIST)   |
|    | ARRESTING GEAR   | FLAT BLACK ANA-604  | 2 COATS LACQUER (ITEM 73,<br>MATERIALS LIST)  |
|   |  | INSIGNIA WHITE ANA-511  | 2 COATS LACQUER (ITEM 72,<br>MATERIALS LIST)  |
|    | VERTICAL SURFACES AND SURFACES VIEWED FROM<br>ABOVE, UNLESS OTHERWISE NOTED. UPPER ONE-<br>HALF OF AUXILIARY FUEL TANK (MEASURED<br>HORIZONTALLY)  | LIGHT GULL GRAY ANA-620   | 2 COATS LACQUER (ITEM 71,<br>MATERIALS LIST)  |
|    | HORIZONTAL SURFACES AND SURFACES VIEWED FROM<br>BELOW (INCLUDING BOTH SIDES OF CONTROL SUR-<br>FACES) UNLESS OTHERWISE NOTED. LOWER ONE-HALF<br>OF AUXILIARY FUEL TANK (MEASURED HORIZONTALLY) | INSIGNIA WHITE ANA-511  | 2 COATS LACQUER (ITEM 72,<br>MATERIALS LIST)  |
| NOT<br>INDICATED<br>OR AS<br>NOTED  | MISCELLANEOUS MARKINGS   | INSIGNIA RED ANA-509<br>FLAT BLACK ANA-604<br>INSIGNIA WHITE ANA-601<br>BRIGHT RED ANA-619<br>INTERNATIONAL ORANGE<br>ANA-508 | (ITEM 74, MATERIALS LIST)<br>(ITEM 73, MATERIALS LIST)<br>(ITEM 73, MATERIALS LIST)<br>(ITEM 73, MATERIALS LIST)<br>(ITEM 72, MATERIALS LIST) |
|  | NONMETALLIC  | LIGHT GULL GRAY ANA-620   | 2 COATS LACQUER (ITEM 71,<br>MATERIALS LIST)  |



\* **Note** Touch up by sanding to feather into surrounding areas. Clean with lacquer thinner, (item 76, materials list). Apply aluminized corogard (item 40, materials list) to levelness. Use red corogard (item 41, materials list) in area around air intake duct.

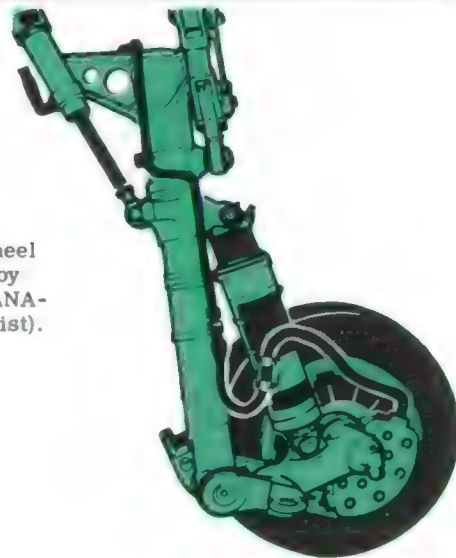
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Figure No. 1-18. Touch-up Painting of Exterior Surfaces (Sheet 1)



NOSE LANDING GEAR

**Note** The interior surfaces of wheel wells may be touched up by applying white lacquer, ANA-511 (item 72, materials list).



MAIN LANDING GEAR

FJ-48-2-55-47

Figure No. 1-18. Touch-up Painting of Exterior Surfaces (Sheet 2)



### WARNING

- Rubber or synthetic rubber gloves should be worn when handling cleaner-brightener compound (item 22, materials list). If the compound is splashed on the person, compound should be immediately washed off with water or a diluent solution of sodium bicarbonate, followed by application of glycerin or petrolatum jelly. Avoid transferring any of the liquid to the eyes or face by contaminated hands or gloves. If the compound or mist gets into the eyes, immediately flush with cold water.
- Do not use cleaner-brightener compound on or as a rinse over magnesium.

### Note

Stubborn corrosive deposits may be removed with cleaner-brightener compound (item 22, materials list). This compound may be brushed or swabbed on. Keep the surface wet with the solution for 5 minutes. Thoroughly rinse off with clear water.

i. The surface should have a neutral or slightly acid reaction. This can be determined by using red litmus paper. Red litmus paper held to the touch-up area should not turn blue. If it does turn blue, a 0.20 to 0.25 chromic acid solution should be applied to the surface, allowed to remain 2 to 5 minutes and then rinsed off. Dry with clean, lint-free cloths.

j. Conduct a "water-break" test. Distilled water sprayed on the bare area should form a film and not run off in streams. Reclean the surface if the water-break test fails.

k. Apply the chemical surface treatment in accordance with Technical Note 38-53 (brush surface treatment for aluminum alloys).

### WARNING

- Surface treatment chemicals are dangerous to handle. Wear goggles, rubberized gloves and protective clothing.
- Applicators for surface treatment chemicals must not be allowed to dry because of the fire hazard. After use, wash the applicator thoroughly and store in a safe place, or otherwise discard.

### Note

- Aluminum alloys, as well as other metals, are chemically treated before the primer and paint coatings are applied. The reason for this chemical treatment is to increase paint adherence and corrosion resistance. Paint will not remain on the surfaces of airplanes without this chemical treatment. The chemical treatment (inorganic) is normally applied at the time of fabrication by scientifically controlled processes. However, strong solvents such as cleaner-brightener compound and paint removers will usually remove this chemical treatment. It is then necessary to re-apply an inorganic treatment to the reworked area.
- Corrosion-resistant steel by nature of its passivity will not require a chemical surface treatment prior to refinishing. In the event of pitting or excessive rusting, the part should be replaced. Magnesium is highly susceptible to corrosion and should never be neglected. Complete chemical surface treatment for magnesium is contained in Specification MIL-M-3171. The chrome-pickle brush-on treatment (item 89, materials list) may be employed for some applications as indicated in the Specification.

### 1-79. APPLICATION OF PRIMING COATS IN TOUCH-UP PAINTING.

1-80. Since the application of fresh finish coats over old primer on painted airplanes is not acceptable (the primer will have excessively hardened from exposure to air and will not have the necessary adhesive qualities), to touch up an area requires a complete surface removal and refinishing procedure. It is necessary to pretreat all exterior surfaces with a coat of wash primer (item 21, materials list). Wash primer is primarily a metal conditioner and an adhesive for additional films. Wash primer should always be used in conjunction with other finishes since it does not in itself have the necessary permanence of other paint finishes. It is repeated that the metal surface must be clean before applying wash primer.

### Note

- In the subsequent paragraphs where reference is made to lacquer primer, refer to item 101, materials list.
- In the subsequent paragraphs, lacquer primer is referred to only when using acrylic nitrocellulose lacquer.

Be prepared to apply wash primer, plus lacquer primer, and to plug the topcoat within 24 hours to obtain maximum adhesion. Normally, less than the amount of the container will be needed for touch-up work; therefore, mix only the amount that you will need. The wash primer comes in a 5-gallon container, of which 4 gallons is the resin component and one gallon is the acid component. Quantities less than the container amount must be mixed proportionately. The acid component is not to be used as a thinner; it is an activator and is to be used only as directed. The adhesive qualities of wash primer progressively diminish after the addition of the acid component. It is recommended that wash primer which has been mixed longer than 4 hours not be used. Wash primer should not be applied on rainy days or to wet surfaces. To mix wash primer, thoroughly stir the resin component. Shake the acid component thoroughly before use, even though no separation of the ingredients is evident. Add the acid component slowly to prevent gelling; keep stirring while adding the acid component. Never add the resin component to the acid component. To prepare the surface and to apply priming coats, proceed as follows:

**Note**

If thinning is necessary to obtain uniform wet films, or other desirable characteristics, isopropyl (99 percent grade) alcohol may be added to the mix for thinning. Either butyl or ethyl alcohol may also be used. The quantity of alcohol added must never exceed twice the volume of the acid component in the mix. (Use as little alcohol as possible since it adversely affects adhesion.) If the relative humidity is above 50 percent, use a thinner consisting of one-half (by volume) isopropyl or ethyl alcohol and one-half (by volume) n-butyl alcohol.

a. Feather-edge (a slight taper) the sides surrounding the area to be touched up with No. 400 wet or dry sandpaper.

b. With the touch-up area completely free of old paint and priming coats, clean the surface with a solution of 70 percent Stoddard Solvent (item 119, materials list), 5 percent perchloroethylene (item 98, materials list) and 25 percent dichloromethane (item 46, materials list). This mixture can be ordered from stock as safety solvent (item 120, materials list).

**WARNING**

Use safety solvent only outdoors or in a well-ventilated room. Avoid excessive breathing of the vapors.

**CAUTION**

Use safety solvent on a dry surface only. Contact with moisture or water could cause corrosion since the chlorinated solvents may hydrolyze and form hydrochloric acid.

c. Spray or brush on properly conditioned wash primer in a single, thin wet coat. Do not attempt to obtain full hiding as this results in poor adhesion. Do not hold the spray gun an exaggerated distance away from the work to obtain a thin coat as this causes a dry film that is also poor in adhesive qualities. If humidity conditions cause blushing, discontinue work. Adding n-butyl alcohol to the wash primer thinner may eliminate blushing.

d. Allow the wash primer to dry. Minimum drying time is one hour; maximum drying time is 2 hours before application of lacquer primer. Drying time should be previously checked on test panels.

e. When the wash primer is dry, scuff the wash primer lightly with clean kraft paper to remove overspray, to smooth out nibs and to obtain a full gloss of the finish coats. Remove any dust with a clean, dry cloth.

f. Aluminum and aluminum alloys require a coat of lacquer primer over the wash primer. Brush or spray on the lacquer primer in a thin homogenous coat, giving ample uniform coverage. One coat of lacquer primer over the coat of wash primer should not hide a No. 2 pencil mark made on the metal before coating. Drying time for lacquer primer applied over wash primer is: minimum 40 minutes, maximum 3 hours.

**CAUTION**

If the material to be used is older than 6 months from date of manufacture, test thoroughly before use. Lacquer primer must be agitated or stirred continuously before and during use.

### 1-81. APPLYING FINISH LACQUER COATS TO EXTERIOR SURFACES IN TOUCH-UP PAINTING.

1-82. Aircraft finishes are relatively highly thinned and settle rapidly when not agitated. It is therefore important that paints be either mechanically or manually stirred both before and during use. Lacquers, in general, have a much lower nonvolatile content than enamels. Since a normal hiding coat of paint is usually 1.0 mil thick, it is necessary that two coats of lacquer be applied where only one coat is required for most types of paint. When all painting considerations are ideal and the materials are prepared, proceed as follows:

a. Feather-edge the painting area margins. The surface must be absolutely clean and free from loose scale.

b. Brush or spray on a coat of acrylic lacquer, and allow to dry for not more than 30 minutes (maximum).

c. Brush or spray on a second wet cross coat of acrylic lacquer and allow to dry thoroughly (minimum drying time for second coat: 24 hours).

**CAUTION**

Do not use rubbing compound or wax on acrylic lacquer.

**Note**

If enamel (item 48, materials list) is being used, first spray on a "flash" coat with a light pass of the gun and, while it is still tacky, follow with a full wet coat. Allow the enamel to dry for at least 48 hours.

d. Apply insignia or markings if necessary.

**Note**

Wax is not permitted on Naval aircraft utilizing the gray and white color scheme.

**1-83. SPECIAL REQUIREMENTS.**

1-84. The major general notes and restrictions for all procedures are grouped below. Before beginning any phase of touch-up painting, all of the special requirements listed below should be studied and weighed against the work to be done.

**I. EFFECTIVITY**—Although the touch-up painting instructions are primarily intended for external finishes, they may also be used for squadron markings, miscellaneous markings and landing gear equipment. It is stressed that these touch-up painting procedures are applicable to small areas only; large areas and complete panel repainting require specialized procedures that are beyond the scope of these instructions.

**II. DISSIMILAR METALS**—Dissimilar metals can corrode because of electrolytic action when in direct contact with each other. It is essential to prevent direct contact between the surfaces of metals in one group and a metal in any of the other groups. Corrosion can occur between metals of the following groups:

**GROUP I**

Magnesium and magnesium alloys

**GROUP II**

Aluminum  
Cadmium  
Zinc and its alloys

**GROUP III**

Tin, iron, lead and their alloys (except stainless steels)

**GROUP IV**

Copper, silver, gold, platinum, nickel, chromium,  
cobalt, titanium, rhodium and their alloys  
Stainless steels and graphite

For information on the location of dissimilar metals on the airplane exterior, see figure 1-19. Adequate protection of the respective metallic surfaces can be achieved by treatment with zinc chromate primer as follows:

a. Contact between group I and any other group—three coats of zinc chromate primer on each surface plus vinyl tape (item 129, materials list).

b. Contacts between any other two groups—two coats primer on each surface.

**Note**

● These requirements do not normally apply to standard parts. Standard attaching parts such as nuts, bolts, washers, rivets, screws, etc, do not require painting before assembly, except they shall receive one coat of primer (wet on close tolerance bolts, wet or dry on all others) prior to assembly when dissimilar metals are being joined. Hi-shear rivets must not be assembled with wet primer. Cuts and scratches on all metal surfaces, including standard parts, rivets and sheet edges, must be touched up with primer and with any finish coats. Nuts, bolts, etc, in joints subsequently lubricated, do not require this touch-up.

● For additional information concerning anti-corrosion precautions, refer to Section XIV of the General Manual for Structural Repair (AN 01-1A-1).

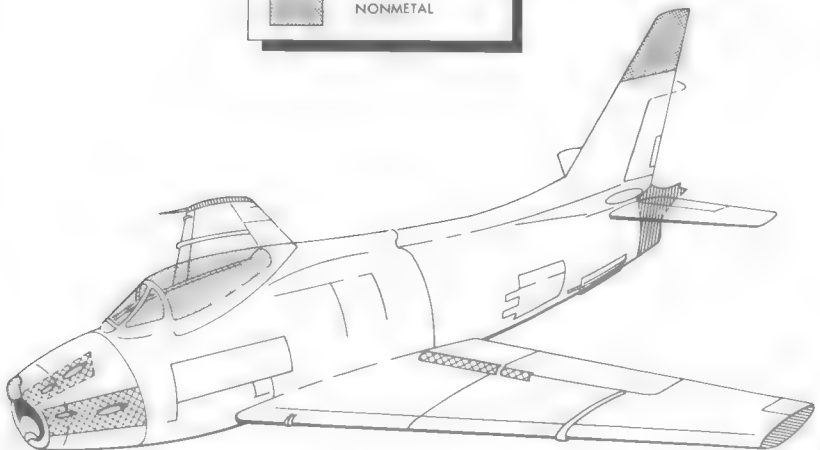
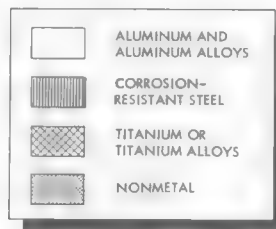
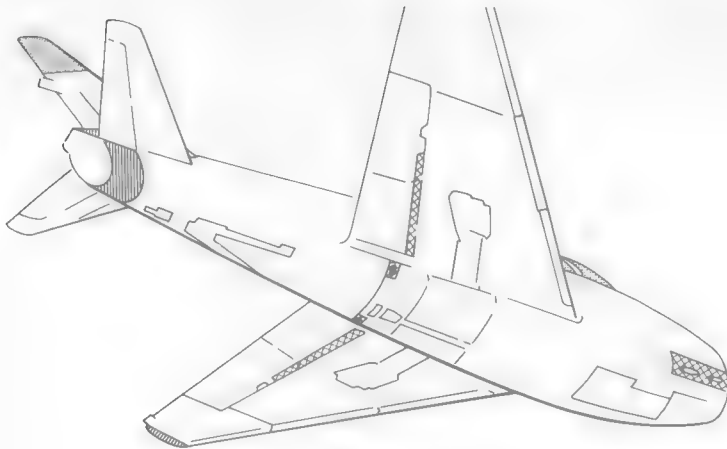
**III. BONDING CONTACTS**—All areas serving as electrical, radio, or electrostatic bonds or connections should have no finish on the contacting surfaces other than the original plating.

**IV. AERODYNAMICALLY SMOOTHED SURFACES**—The critical nature of leading edge contours places touch-up painting of these areas beyond the scope of field maintenance and is not included in this handbook. Touch-up painting is not to be accomplished 4 inches back from the leading edge of the nose section, empennage and wing. The nose of the drop tank is left unpainted.

**V. FUNCTIONAL EQUIPMENT**—No paint shall be applied to movable bearing surfaces, adjustable screw threads, oil holes, surfaces contacting any liquid or lubricant, or to any fitting or surface where painting could cause malfunction. Care should be exercised to keep paint off hydraulic and landing gear systems that do not require finishing.

**VI. AIR PASSAGES**—Air intake ducts and other atmospheric openings must not be primed and painted and must be fully protected by masking whenever adjacent areas are being touched up.





FJ-48-2-55-48

Figure No. 1-19. Dissimilar Metals (Exterior Surface)

VII. ACID-PROOFING—All exposed interior surfaces within one foot of the battery and other areas further removed but subject to acid spillage should be given two coats of black lacquer (item 75, materials list) in addition to the regular paint coats. The battery compartments should be frequently acid-neutralized, cleaned and touched up with paint.

VIII. NONMETALLIC AREAS—Surfaces composed of plastic, laminated plastic and other nonmetallic substances require special painting procedures and, as such, are not considered as field maintenance. Minor defects in painted laminated plastic surfaces can be touched up by daubing with the finish paint. Do not strip or prime these areas.

IX. MINOR REWORK OF ABRADED CORROSION-RESISTANT STEEL AND MAGNESIUM SURFACES—Scratches, chipped paint and light rust spots on these metals can be refinished by the procedures listed as follows:

- a. Remove all rust and corrosion by using a very light grade of abrasive paper. Clean the area thoroughly with a mild cleaning compound.
- b. Conduct the litmus paper and "water-break" tests. (Refer to steps i. and j., paragraph 1-78.)

- c. Apply one coat of wash primer.
- d. Apply one coat of zinc chromate primer or lacquer primer, as applicable.
- e. Apply lacquer or enamel finish paint.

**CAUTION**

Do not use cleaner-brightener compound (item 22, materials list) or other strong cleaning agents.

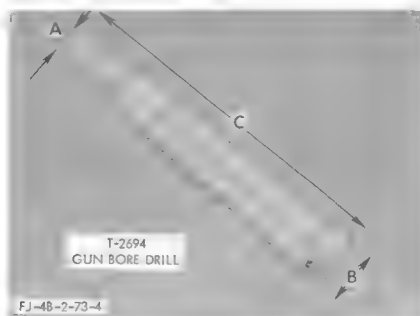
X. AIRPLANE INTERIOR—There is seldom any need for interior airplane touch-up painting at an operational level. Touch-up painting is necessary only for protection against corrosion, or in the cockpit where the colors of the various control handles and knobs must be vivid for ready reference. When touching up the interior of the airplane, as a temporary field fix, priming and finish coats should be applied as required over a clean surface, but paint stripping and chemical surface treatment should seldom be required.

**SPECIAL TOOLS AND EQUIPMENT****1-85. SPECIAL TOOLS AND EQUIPMENT.**

1-86. The following tools and equipment are used for ground handling and general maintenance of the airplane:

| PART NO.       | NOMENCLATURE  | PARAGRAPH NO. |
|----------------|---|---------------|
| E6076          | Adapter, aft fuselage to Air Logistics dolly 4000A<br>(consists of E3836 and E3837)         | 1-17, 2-6     |
| E2627          | Adapter, engine to Air Logistics dolly 4000A  | 1-17          |
| E6551          | Adapter, engine to Air Logistics dolly 4000A<br>and engine manufacturer's various equipment | 1-17          |
| 208000         | Adapter, ground fuel check (for use with MA-2 in-flight<br>refueling nozzle)                | 4-289         |
| T2644          | Adapter, main landing gear side brace to wing<br>fitting torque wrench                      | 3-128         |
| T2588-11       | Adapter, union nut torque wrench  | 2-6           |
| 209-532115     | Ballast installation  | 1-5*          |
| E3584          | Bar, nose gear positioning  | 1-29          |
| E2642          | Batten, aileron   | 1-19          |
| E2461          | Bracket, bomb hoisting  | 7-164, 7-165  |
| E2645          | Bundle, jacking, mooring and leveling   | 1-15          |
| E1939-11 & -12 | Fitting, aft fuselage adapter forward attachment  | 1-15          |
| E1957          | Fitting, forward jacking  | 1-15          |
| E2636          | Pad, wing jack  | 1-15, 2-12    |
| E2637-3        | Ring, airplane jacking and mooring  | 1-15          |
| E1008          | Screw, plumb bob leveling   | 1-15          |
| T2533          | Clamp, engine ball joint support  | 1-17, 2-6     |
| 181-51032      | Cover, angle-of-attack probe  | 1-19          |
| E2629          | Cover, cockpit and nose enclosure   | 1-19          |
| E2634          | Cover, compressor compartment air bleed duct  | 1-19          |
| D674648        | Cover, dust, Mark 8 gun sight (GFE)   |               |
| 170-73073      | Cover, pitot tube   | 1-19          |
| E2630-1 & -2   | Cover, wing fold enclosure  | 1-19          |
| T2614          | Driver, wing fold manual unlock   | 1-11, 3-59    |
| T2598          | Drive, wing outboard panel hinge pin installation   | 2-13          |
| E1964-11       | Fitting, aft hoisting   | 1-18          |
| E2672-11 & -12 | Fitting, auxiliary fuselage jacking   | 1-14          |
| E1965          | Fitting, forward hoisting   | 1-18          |

\*Refer to Supplemental Handbook of Maintenance Instructions (NAVAER 01-60JKE-502A)



| DASH NO. | STANDARD HOLE SIZE ( $\pm .0005$ IN.) | A    | B     | C       |
|----------|---------------------------------------|------|-------|---------|
| -21      | .4375                                 | 3/8  | .4370 | 4-15/16 |
| -19      | .2500                                 | 3/16 | .2495 | 6       |
| -17      | .1875                                 | 3/16 | .1870 | 6       |
| -15      | .2500                                 | 3/16 | .2495 | 2-7/8   |
| -13      | .4370                                 | 3/8  | .4365 | 5-1/2   |
| -11      | .1890                                 | 3/16 | .1885 | 5       |
| -9       | .5000                                 | 3/8  | .4995 | 6       |
| -7       | .3750                                 | 1/4  | .3745 | 6       |
| -5       | .3125                                 | 1/4  | .3120 | 7       |
| -3       | .3125                                 | 1/4  | .3120 | 3       |

Figure No. 1-20. Special Tools

| PART NO.            | NOMENCLATURE  | PARAGRAPH NO.                   |
|---------------------|---|---------------------------------|
| E2127               | Fitting, heat and vent duct pressure test   | 4-78                            |
| T2605-1 & -2        | Fixture, aileron rigging  | 2-322                           |
| T2616-1 & -2        | Fixture, elevator rigging   | 2-76                            |
| T2747-1 & -2*       | Fixture, flap spoiler and wing leading edge rigging   | 2-76, 2-322                     |
| T2684               | Fixture, horizontal stabilizer rigging  | 2-76                            |
| T2701               | Fixture, rudder rigging (splitter rudder)   | 2-76                            |
| T2610-1 & -2        | Fixture, wing outboard leading edge rigging   | 2-326                           |
| T2736*              | Guide, aileron attach bolt  |                                 |
| T2697               | Guide, wing to fuselage attach bolt, station 182.125  | 2-12                            |
| T2698               | Guide, wing to fuselage attach bolt, station 209.80   | 2-12                            |
| T2602               | Guide, wing to fuselage forward attach bolt   | 2-12                            |
| T2694-3 through -21 | Gun bore drills   | 1-85                            |
| 223                 | Gun, groove sealant injection   | 4-234                           |
| T309                | Handle, hinge pin tools   | 2-14, 2-15, 2-233, 2-316, 2-317 |
| E2641               | Lock, main landing gear ground safety   | 1-7                             |
| E1961               | Lock, nose gear ground safety   | 1-7                             |
| E6041               | Mat, wing walkway   | 1-12                            |
| T2587               | Nut, field break stud torque wrench adapter   | 2-7                             |
| E2639               | Pad, auxiliary wing jacking   | 2-12                            |
| T276-20             | Peep sight, gun bore-sighting   | 7-227                           |
| 181-484190          | Pin assembly, drop tank ejector, ground safety  | 4-267                           |
| E6107               | Pin assembly, drop tank ground safety   | 4-267, 7-150                    |
| ALX92-15            | Pin, safety (2 required), primary canopy initiator and canopy emergency release handle  | 1-7, 2-56                       |
| NAF312508-2         | Pin, safety, seat catapult  | 1-7, 2-64                       |
| E6042               | Pin, universal pylon, ground safety   | 4-298, 7-165                    |
| 194-73069           | Plug, engine burner compartment cooling duct  | 1-19                            |
| E2632               | Plug, engine trunnion cooling   | 1-19                            |
| E2595               | Plug, fuel system vent drain line   | 4-158                           |
| E2594               | Plug, fuel system vent line field break disconnect  | 4-158                           |
| E2083-11            | Plug, fuel tank vent line outlet  | 4-158                           |
| E2633               | Plug, heat exchanger outlet   | 1-19                            |
| T2590               | Puller, outboard panel hinge pin removal  | 2-13                            |
| T2596               | Puller, wing forward attach bolt  | 2-11                            |
| T2645-1 & -2        | Rig pins  | 2-76                            |
| T2668               | Ring sight, gun bore-sighting   | 7-227                           |
| E6045               | Scale assembly, spring  | 2-154, 2-227                    |
| 181-73057-101       | Screen, engine air intake   | 1-7                             |
| 194-73061           | Shield, engine air intake   | 1-19                            |
| E2631               | Shield, engine exhaust tail pipe  | 1-19                            |
| E2535               | Sling, airplane complete hoisting   | 1-18, 2-12                      |
| E3579               | Sling, outboard wing panel hoisting   | 1-18                            |
| E2568               | Sling, power plant hoisting   | 1-18                            |
| E2590               | Sling, rear fuselage  | 1-18                            |
| E2598               | Sling, wing panel   | 1-18                            |
| HT-3304M            | Socket adapter  | †                               |
| HT-3305M            | Socket adapter  | †                               |
| HT-3306M            | Socket adapter  | †                               |
| HT-3407M            | Socket adapter  | †                               |
| HT-3408M            | Socket adapter  | †                               |
| E6085               | Strap assembly, 150-gallon fuel tank hoisting   | 4-278                           |
| 209-53118-11        | Streamer assembly, primary canopy initiator and headrest trigger mechanism (incorporates safety pin AN415-2 and provisions for safety pin ALX92-15) | 1-7, 2-64                       |

\*No BuAer approval at time of printing

†See figure 2-11

| PART NO.  | NOMENCLATURE   | PARAGRAPH NO.                   |
|-----------|--|---------------------------------|
| E2628-101 | Strut, wing fold jury  | 1-19                            |
| T2586     | Stud, field break stud torquing  | 2-7                             |
| E2747     | Support, arresting gear  | 1-30, 2-6                       |
| T310      | Tool, hinge pin installation   | 2-14, 2-15, 2-233, 2-316, 2-317 |
| T308      | Tool, hinge pin removal  | 2-14, 2-15, 2-233, 2-316, 2-317 |
| OT 301-1* | Tool, inserting Teflon ring, liquid oxygen filler valve (ARO)  | 4-127                           |
| T2580-11  | Tool, muzzle stabilizer adjustment   | 7-24                            |
| T2738     | Tool, ram-air door closing   | 2-126                           |
| 406465    | Tool, unloading and delinking for 20mm aircraft guns   | 7-38                            |
| E2605     | Tow bar  | 1-13                            |
| E3757     | Wrench, 6-inch missile launcher  | 7-153                           |
| T2589-11  | Wrench, aft gun mount elevation adjustment   |                                 |
| T2741     | Wrench, aft gun mount elevation adjustment No. 2   | 7-228                           |
| T2832     | Wrench assembly, Aero 7A bomb rack<br>(Use extension, Snap-On Part No. L-62, ¾-inch extension, 8 inches long, or equivalent, with NAA tool T2832.) | 7-156                           |
| H-161-16  | Wrench, box ratchet, gun feeder mechanism  | 7-37                            |
| T2707     | Wrench, drop tank transfer fitting spanner   |                                 |
| T2675     | Wrench, gun mount azimuth adjustment   | 7-228                           |
| T2705     | Wrench, in-flight refueling cap spanner  | 4-288, 4-290                    |
| T2706     | Wrench, in-flight refueling retainer spanner   | 4-288, 4-290                    |
| T2709-11  | Wrench, pylon beam 8-inch extension  | 7-156                           |
| T2743-11  | Wrench, pylon beam 12-inch extension   | 7-156                           |
| T2742-11  | Wrench, pylon beam 14-inch extension   | 7-156                           |
| E2745     | Wrench, socket head, bomb pylon  | 7-156                           |
| E3829     | Fixture assembly, wing mating  | 1-14A                           |
| E6472     | Line, liquid oxygen filling overboard vent   | 1-37                            |
| T2744     | Nozzle, NAS516 flush lubricator straight needle  | 1-53                            |
| T2745     | Nozzle, NAS516 flush lubricator 90-degree needle   | 1-53                            |

\*No BuAer approval at time of printing



**CONSUMABLE MATERIALS****1-87. CONSUMABLE MATERIALS.**

1-88. The following consumable materials are used in servicing and maintenance of the airplane.

| ITEM NO. | NOMENCLATURE                                  | SPECIFICATION OR STOCK NO.           | MANUFACTURER                           | SUBSTITUTE |
|----------|---|--------------------------------------|--|------------|
| 1        | Accelerator                                   | 983C                                 | Goodyear Tire and Rubber Co., Inc.     |            |
| 2        | Adhesive, Resin, Epoxy Base                   | MIL-A-5090                           |  |            |
| 3        | Adhesive, Rubber (EC-870)                     | MIL-A-1154; Stock No. G8040-273-8717 | Minnesota Mining and Manufacturing Co. |            |
| 4        | Adhesive, Synthetic Rubber                    | MIL-A-5092                           |  |            |
| 5        | Alcohol, Butyl, Normal                        | TT-B-846; Stock No. G6810-281-6928   |  |            |
| 6        | Alcohol, Ethyl, Specially Denatured, Aircraft | MIL-A-6091; Stock No. G6810-222-2374 |  |            |

**WARNING**

This compound is deadly if taken internally.

|    |   |                                    |   |             |
|----|---|------------------------------------|---|-------------|
| 7  | Alcohol, Isopropyl, 99 Percent Grade  | Stock No. G6810-275-6010           |   | MIL-A-10428 |
| 8  | Anti-seize Compound, Fel-Pro C-5  | Stock No. R52C3265700              |   |             |
| 9  | Anti-seize Compound, White-lead Base, General Purpose (For Threaded Fittings) | JAN-A-669; Stock No. R52C3095      |   |             |
| 10 | Benzene, Industrial Grade   | VV-B-231; Stock No. W6810-246-6472 |   |             |
| 11 | Benzoin Catalyst  | No. 302 or equivalent              | Eastman Kodak Co.   |             |
| 12 | Benzoyl Peroxide Paste  | Luperco ATC or Garalyst            | Lucidol Division, Novadel-Agene Corp., Cadet Laboratories, or Thalgo Glass Fiber Products |             |
| 13 | Cellophane Sheet  |                                    | Commercial  |             |
| 14 | Cement, Bonding EC-226  | MIL-C-2749                         | Minnesota Mining and Manufacturing Co.  | EC-524      |
| 15 | Cement, General Purpose, Synthetic Base                                       | MIL-C-4003                         |   |             |
| 16 | Cement, Top Coat Base   | 1801C                              | Goodyear Tire and Rubber Co., Inc.  |             |

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| ITEM NO.  | NOMENCLATURE  | SPECIFICATION OR STOCK NO.   | MANUFACTURER   | SUBSTITUTE  |
|---|---|--|--|-------------|
| 17  | Chemical Films for Aluminum and Aluminum Alloys                               | MIL-C-5541; Stock No. R51MIL-C-5541K   |  |             |
| 18  | Cleaner, Heavy Duty "Spray Glaze"   | Stock No. R51P1010   | Spray Glaze Co.,<br>100 Michigan Blvd.,<br>Chicago, Illinois |             |
| 19  | Cleaner, Rifle Bore   | JAN-C-372; Stock No. G6850-224-6663  |  |             |
| 20  | Cloth, Abrasive, Crocus   | P-C-458; Stock No. GF5360-221-0872   |  |             |
| 21  | Coating, Pretreatment, Smooth Finish, Spray Type (For Aircraft) (Wash Primer) | MIL-C-8514 (Aer)   |  |             |
| 22  | Compound, Cleaner and Brightener, Non-flammable                               | MIL-C-5410; Stock No. R51C1564-200   |  |             |
| 23  | Compound, Cleaning  | Stock No. R51C1568-400   |  |             |
| 24  | Compound, Cleaning, Aircraft Surface  | MIL-C-18687 (Aer);<br>Stock No. R51C1569-100   |  |             |
| 25  | Compound, Cleaning, Steam   | MIL-C-6135 (Aer);<br>Stock No. R51C1313-630  |  |             |
| 26  | Compound, Corrosion-preventive, Aircraft Engine                               | MIL-C-6529; Stock No. W6850-209-7235   |  |             |
| 27  | Compound, Corrosion-preventive, Aircraft Engine, Heavy Oil Type               | MIL-C-5545; Stock No. W6850-274-8532   |  |             |
| <p style="text-align: center;">Note</p> <p style="text-align: center;">This compound is used only for static preservation and is to be removed from engine prior to flight.</p> |   |  |  |             |
| 28  | Compound, Corrosion-preventive, Fingerprint Remover                           | MIL-C-15074; Stock No. W8030-252-8300  |  |             |
| 29  | Compound, Grease-cleaning, Solvent Emulsion-type                              | MIL-C-7122 (Aer); Type I—<br>Stock No. R51C1615-545,<br>Type II—<br>Stock No. R51C1615-540 |  |             |
| 30  | Compound, Hand Rubbing  | Commercial   | Mac's Supergloss Polish Co.                                  |             |
| 31  | Compound, Integral Fuel Tank, Groove Injection Sealing                        | PR-703A  | Products Research Co.  |             |
| 32  | Compound, Polishing (For Acrylic Plastic)                                     | MIL-C-5547; Stock No. R51C1606-25  |  | MIL-C-18787 |
| 33  | Compound, Potting   | R52C3258-250   |  |             |
| 34  | Compound, Rubbing (For Lacquered Surfaces)                                    | TT-R-711;<br>Stock No. R51C1606-50   |  |             |



| ITEM NO. | NOMENCLATURE  | SPECIFICATION OR STOCK NO.                                 | MANUFACTURER  | SUBSTITUTE   |
|----------|---|--|---|--|
| 35       | Compound, Sealing                                       | PR-341<br>EC-1547<br><br>730                               | Products Research Co.<br>Minnesota Mining and<br>Manufacturing Co.<br>Coast Proseal |  |
| 36       | Compound, Weather Coating                               | A56B   | B. F. Goodrich Co.  |  |
| 37       | Cord, Linen   | MIL-C-2520   |   |  |
| 38       | Cord, Nylon   | MIL-C-5040   |   |  |
| 39       | Core Material, Plastic Honeycomb                        | MIL-C-8073   |   |  |
| 40       | Corogard, Aluminized $\pm 14$                           | EC-8435  | Minnesota Mining and<br>Manufacturing Co.   |  |
| 41       | Corogard, Red   |  | Minnesota Mining and<br>Manufacturing Co.   |  |
| 42       | Corrosion-preventive Oil, Gas Turbine, Aircraft         | MIL-C-8188; Stock No.<br>W6850-209-7232                    |   |  |
| 43       | Corrosion Preventive, Petrolatum, Hot Application       | MIL-C-11796 (Four<br>Classes); Stock No.<br>W8030-244-1303 |   |  |
| 44       | Corrosion Preventive, Solvent Cutback, Cold Application | MIL-C-16173<br>(Four Grades); Stock No.<br>W8030-244-1297  |   |  |
| 45       | Decalcomanias   | MIL-D-8635<br>(Type II, Class B)                           |   |  |
| 46       | Dichloromethane, Technical ("Methylene Chloride")       | MIL-D-6998;<br>Stock No. R51M950-10                        |   |  |
| 47       | Enamel, Gloss, For Aircraft Use, Insignia White, ANA511 | MIL-E-7729, Type I   |   |  |
| 48       | Enamel, Heat-resisting, Gloss Black                     | MIL-E-5557;<br>Stock No. R52E4100                          |   |  |
| 49       | Fabrics, Woven Glass, Finished, For Plastic Laminates   | MIL-F-9084   |   |  |
| 50       | Filler, Tuf-on Filaplast                                | P-24A  | Brooklyn Varnish<br>Manufacturing Co.   | CAT-A-LAC<br>White Filler Putty<br>No. 476-2<br>(Finch Paint and<br>Chemical Co.,<br>Torrance, Calif.) |
| 51       | Firewall Sealant  | EC-1548 or equivalent                                      | Minnesota Mining and<br>Manufacturing Co.   |  |
| 52       | Fluid, Anti-icing (Alcohol)                             | MIL-F-5566   |   |  |
| 53       | Fluid, Compass, Aircraft                                | MIL-L-5020;<br>Stock No. R51L395                           |   |  |

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| ITEM NO. | NOMENCLATURE    | SPECIFICATION OR STOCK NO.                                 | MANUFACTURER      | SUBSTITUTE   |
|----------|-----------------|--|-------------------|--|
| 54       | Fluid, Silicone | DC-200<br>20 Centistokes;<br>Stock No. R51DCR-<br>DC200-20 | Dow Corning Corp. | Emergency Alter-<br>nate:<br>MIL-L-7870;<br>MIL-L-6085 |

|    |  |            |
|----|--|------------|
| 55 | Fuel, Aircraft<br>Reciprocating Engine | MIL-G-5572 |
|----|--|------------|

**WARNING**

This fuel contains tetraethyl lead. Personnel should avoid contact with this fuel as it is a dangerous poison. Avoid breathing the fumes.

|    |   |  |
|----|---|--|
| 56 | Fuel, Aircraft Turbine<br>and Jet Engine, JP-4<br>and JP-5            | MIL-F-5624                               |
| 57 | (Deleted.)  | Use item No. 32.                         |
| 58 | Glass Fiber, Cord   | MIL-Y-1140                               |
| 59 | Glass Fiber Mat   | MIL-M-15517                              |
| 60 | Graphite, Lubricating<br>(Dry Powder)                                 | MIL-G-6711                               |
| 61 | Grease, Aircraft and<br>Instrument (For Low<br>and High Temperatures) | MIL-G-3278; Stock No.<br>WS9150-261-8297 |

**CAUTION**

- The special synthetic oils used in this grease may soften paint, natural rubber, neoprene and electrical insulating materials.
- This grease should not be used on equipment requiring extreme pressure or special anti-wear additives.

|    |   |  |
|----|---|--|
| 62 | Grease, Aircraft Gear<br>and Actuator Screw for<br>Low and High Tempera-<br>tures | MIL-G-7118; Stock No.<br>WR9150-223-4014 |
|----|---|--|

**CAUTION**

The special synthetic oils used in this grease may soften paint, natural rubber, neoprene and electrical insulating materials.

|    |                                    |            |
|----|------------------------------------|------------|
| 63 | Grease, Extreme Low<br>Temperature | MIL-G-7421 |
|----|------------------------------------|------------|

**CAUTION**

- The special synthetic oils used in this grease may soften paint, natural rubber, neoprene and electrical insulating materials.
- This grease should not be used on equipment requiring extreme pressure or special anti-wear additives.

**Note**

This lubricant should not be used in lieu of Specification MIL-G-3278.

|    |   |  |
|----|---|--|
| 64 | Grease, Graphite,<br>Aircraft Lubricating | MIL-G-7187; Stock No.<br>WM9150-190-0922 |
| 65 | (Deleted.)                                |  |

| ITEM NO. | NOMENCLATURE  | SPECIFICATION OR STOCK NO.              | MANUFACTURER | SUBSTITUTE |
|----------|---|---|--------------|------------|
| 66       | Insulating and Sealing Compound, Electrical   | MIL-I-8660; Stock No. GM17-I-39154-4805 |              |            |
| 67       | Insulation, Electrical (Surco)  | MIL-I-631                               |              |            |
| 68       | Insulation Sleeving, Electrical, Flexible, Treated  | MIL-I-3190                              |              |            |
| 69       | Insulation Tape, Electrical, Pressure-sensitive, Plastic  | MIL-I-7798                              |              |            |
| 70       | Kerosene  | VV-K-211; Stock No. WF9140-242-6751     |              |            |
| 71       | Lacquer, Acrylic-nitro-cellulose Camouflage; Light Gull Gray, ANA620; Insignia White, ANA601; Insignia Blue, ANA605; Bright Red, ANA619 | MIL-I-19538 (Aer)                       |              |            |

  
CAUTION

Use over primer (Specification MIL-P-7962) only.



| ITEM NO.  | NOMENCLATURE  | SPECIFICATION OR STOCK NO.                                  | MANUFACTURER | SUBSTITUTE |
|---|---|---|--------------|------------|
| 72  | Lacquer, Acrylic-nitro-cellulose (Glossy);<br>Insignia White, ANA511;<br>Insignia Red, ANA509;<br>International Orange, ANA508;<br>Insignia Blue, ANA502                      | MIL-I-19537 (Aer)   |              |            |
| <div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; display: inline-block;">CAUTION</div> </div> <p style="text-align: center;">Use over primer (Specification MIL-P-7962) only.</p> |   |   |              |            |
| 73  | Lacquer, Camouflage;<br>Light Gull Gray, ANA620;<br>Dark Gull Gray, ANA621;<br>Flat Black, ANA604;<br>Insignia White, ANA601;<br>Insignia Blue, ANA605;<br>Bright Red, ANA619 | MIL-L-006805B (Aer)   |              |            |
| <p style="text-align: center;"><b>Note</b><br/>This lacquer is not for exterior use.</p>  |   |   |              |            |
| 74  | Lacquer, Cellulose Nitrate, Gloss, For Aircraft Use;<br>Insignia Blue, ANA502;<br>Insignia White, ANA511;<br>Insignia Red, ANA509   | MIL-L-7178  |              |            |
| <p style="text-align: center;"><b>Note</b><br/>This lacquer is not for exterior use.</p>  |   |   |              |            |
| 75  | Lacquer, Spraying, Acid-resistant (For Aluminum Surfaces Around Storage Batteries);<br>Flat Black, ANA604   | TT-L-54;<br>Stock No. R52L40-25                             |              |            |
| 76  | Lacquer Thinner   | TT-T-266;<br>Stock No. R52T593;<br>Stock No. G8010-160-5789 |              | MIL-T-6094 |
| 77  | Lacquer Thinner, Acrylic-nitrocellulose   | MIL-T-19544   |              |            |
| 78  | Lacquer Thinner, Blush Retarding  | MIL-T-6095;<br>Stock No. R52T597                            |              |            |
| 79  | Lubricating Grease NRL-GLT-700-60   | MIL-L-19701 (NOrd)<br>Stock No. J941-L-4025                 |              |            |
| 80  | Lubricant, Molybdenum Disulfide   | MIL-M-7866;<br>Stock No. W6810-227-0431                     |              |            |

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| ITEM NO. | NOMENCLATURE                                       | SPECIFICATION OR STOCK NO.               | MANUFACTURER | SUBSTITUTE |
|----------|--|--|--------------|------------|
| 81       | Lubricating Grease<br>(Gasoline and Oil Resistant) | MIL-G-6032; Stock No.<br>WF9150-257-5360 |              |            |

Note

This grease is not to be used with synthetic oils (not a low-temperature lubricant).

|    |  |  |  |  |
|----|--|--|--|--|
| 82 | Lubricating Grease<br>(General Purpose Aircraft) | MIL-L-7711; Stock No.<br>WF9150-257-5361 |  |  |
|----|--|--|--|--|

**CAUTION**

This grease should not be used on equipment requiring extreme pressure or special anti-wear additives.

|    |   |  |  |  |
|----|---|--|--|--|
| 83 | Lubricating Grease,<br>High-temperature | MIL-L-3545; Stock No.<br>WF9150-223-4003 |  |  |
|----|---|--|--|--|

Note

This material is satisfactory in many instances for antifriction bearings which are required to start at a temperature of 40°C (40 F) if an adequate run-in period is allowed to channel the grease properly before attempting low-temperature starting.

|    |  |   |  |  |
|----|--|---|--|--|
| 84 | Lubricating Grease<br>(High-temperature,<br>Electric Motor, Ball and<br>Roller Bearings) | MIL-L-15719; Stock No.<br>WS9150-257-5358 |  |  |
|----|--|---|--|--|

|    |   |            |  |  |
|----|---|------------|--|--|
| 85 | Lubricating Grease,<br>Pneumatic System | MIL-L-4343 |  |  |
|----|---|------------|--|--|

|    |   |  |  |  |
|----|---|--|--|--|
| 86 | Lubricating Oil, Aircraft<br>Instrument, Low Volatility | MIL-L-6085; Stock No.<br>WF9150-231-6686 |  |  |
|----|---|--|--|--|

|    |  |  |  |  |
|----|--|--|--|--|
| 87 | Lubricating Oil, Aircraft<br>Turbine Engine,<br>Synthetic Base | MIL-L-7808; Stock No.<br>WS9150-227-0184 |  |  |
|----|--|--|--|--|

|    |  |  |  |  |
|----|--|--|--|--|
| 88 | Lubricating Oil, General<br>Purpose, Low-temperature | MIL-L-7870; Stock No.<br>WQ9150-263-3490 |  |  |
|----|--|--|--|--|

|    |  |  |  |  |
|----|--|--|--|--|
| 89 | Metal Treating<br>Chemicals for<br>Magnesium | MIL-M-3171,<br>Type I; Stock No.<br>G51P1763 |  |  |
|----|--|--|--|--|

|    |                     |                                       |  |  |
|----|---------------------|---------------------------------------|--|--|
| 90 | Methyl-ethyl-ketone | TT-M-261; Stock No.<br>G6810-281-2762 |  |  |
|----|---------------------|---------------------------------------|--|--|

|    |                    |                               |  |  |
|----|--------------------|-------------------------------|--|--|
| 91 | Naphtha, Aliphatic | TT-N-95; Stock No.<br>R52N450 |  |  |
|----|--------------------|-------------------------------|--|--|

|    |                                |                                      |  |  |
|----|--------------------------------|--------------------------------------|--|--|
| 92 | Naphtha, Petroleum<br>Aromatic | TT-N-97; Stock No.<br>W6810-244-7637 |  |  |
|----|--------------------------------|--------------------------------------|--|--|

**WARNING**

Naphtha is a poisonous, flammable, volatile solvent and should be used only if adequate ventilation is present. Avoid prolonged breathing of vapor.

|    |                          |            |  |  |
|----|--------------------------|------------|--|--|
| 93 | Nitrogen, Liquid and Gas | MIL-N-6011 |  |  |
|----|--------------------------|------------|--|--|

| ITEM NO. | NOMENCLATURE                             | SPECIFICATION OR STOCK NO.               | MANUFACTURER      | SUBSTITUTE |
|----------|--|--|-------------------|------------|
| 94       | Nonhardening Canopy Pressure Sealant     | X-2706<br>Silastic                       | Dow Corning Corp. |            |
| 95       | Oil, Hydraulic, Aircraft, Petroleum Base | MIL-O-5606; Stock No.<br>WR9150-223-4134 |                   |            |
| 96       | Oil, Preservative, Hydraulic Equipment   | MIL-O-6083; Stock No.<br>WF9150-265-4412 |                   |            |

## Note

The rust-preventive additive increases the low-temperature viscosity of this oil and, consequently, it is not suitable as an operating fluid in aircraft hydraulic systems.

|    |                                      |          |  |  |
|----|--------------------------------------|----------|--|--|
| 97 | Oxygen, 99.5 Percent, Gas and Liquid | BB-O-925 |  |  |
|----|--------------------------------------|----------|--|--|

**WARNING**

Liquid oxygen is the hottest cold item in aviation. If contact is made with bare skin, seek medical care immediately.

|    |  |                                      |  |  |
|----|--|--------------------------------------|--|--|
| 98 | Perchloroethylene ("Tetrachloroethylene"), Technical Grade | O-P-191; Stock No.<br>G5810-270-9982 |  |  |
|----|--|--------------------------------------|--|--|

**WARNING**

- Volatile solvent.
- Use with adequate ventilation.
- Avoid prolonged or repeated breathing of vapor.
- Avoid prolonged or repeated contact with skin.
- Do not take internally.

|     |   |  |                               |  |
|-----|---|--|-------------------------------|--|
| 99  | Perlite Filler (Light-weight Inorganic) | NA2-4157   | North American Aviation, Inc. |  |
| 100 | Petrolatum, Technical                   | VV-P-236; Stock No.<br>W59150-250-0926           |                               |  |
| 101 | Primer, Lacquer                         | MIL-P-7962                                       |                               |  |
| 102 | Primer, Zinc Chromate, For Aircraft Use | MIL-P-6889,<br>Type 1; Stock No.<br>R52P20660-25 |                               |  |

## Note

To obtain the pretinted primer, include the following information: "Pretinted to match interior green, color No. 611." Untinted zinc chromate primer will be applied over wash primer (Specification MIL-C-8514) on surfaces to be painted with lacquer topcoats.

| ITEM NO. | NOMENCLATURE                                 | SPECIFICATION OR STOCK NO.                 | MANUFACTURER | SUBSTITUTE |
|----------|--|--|--------------|------------|
| 103      | Remover, Paint, Nonflammable, Water-rinsable | MIL-R-8633 (Aer);<br>Stock No. R52C3157-50 |              |            |

**WARNING**

- Paint remover is toxic and contains ingredients harmful to skin and eyes.
- Avoid contact of the remover with rubber, asphaltic base floors and walkways.
- Personnel should not enter airplane during removing or subsequent clean-up procedure.
- Use goggle-type eyeglasses and rubber gloves. If remover gets on skin, flood affected area with large quantities of water and rinse freely with diluted alcohol. Apply vaseline or petroleum jelly.
- If remover gets into eyes, flood with water using eye cup; bathe well with 3 percent boric acid solution; then, add a few drops of U.S.P. castor oil and obtain medical attention.

|     |  |  |  |  |
|-----|--|--|--|--|
| 104 | Remover, Paint, Non-flammable, Water-rinsable (For use in Contact with Synthetic Rubber) | MIL-R-18553 (Aer);<br>Stock No. R52C3159-225 |  |  |
|-----|--|--|--|--|

**WARNING**

- Volatile solvent.
- Use with adequate ventilation.
- Avoid prolonged or repeated breathing of vapor.
- Avoid prolonged or repeated contact with skin.
- Do not take internally.

|     |   |                           |  |  |
|-----|---|---------------------------|--|--|
| 105 | Resin, Low-pressure Laminating                | MIL-R-7575                |  |  |
| 106 | Resin, Prebodied Methyl Methacrylate          | NA2-4152                  | North American Aviation, Inc.                  |  |
| 107 | Sandpaper, Wet or Dry Grit, From 320A to 600A | Stock No. GA5350-224-7201 | Minnesota Mining and Manufacturing Co.         |  |
| 108 | Sealant                                       | EC-1135                   | Minnesota Mining and Manufacturing Co.         |  |
| 109 | Sealant, Duct, High-temperature Resistant     | NA2-0312                  | North American Aviation, Inc.                  |  |
| 110 | Sealing Compound, General Purpose             | NA2-0315                  | North American Aviation, Inc.                  |  |
| 111 | Sealing Compound, Pressure Cabin              | MIL-S-7124                |  |  |
| 112 | Sealing Compound; Sealant, Accelerator        | PR-341<br>PR-341A         | Products Research Co.<br>Products Research Co. |  |
| 113 | Sealing Compound, Synthetic Glass             | MIL-S-7126                |  |  |



| ITEM NO. | NOMENCLATURE   | SPECIFICATION OR STOCK NO.   | MANUFACTURER                           | SUBSTITUTE |
|----------|--|--|--|------------|
| 114      | Sealing Compound, Synthetic Rubber (Potting)   | MIL-S-8516   |  |            |
| 115      | Soap, Castile  | MIL-S-4282   |  |            |
| 116      | Sodium Bicarbonate, Technical Grade  | O-S-576; Stock No. G6810-240-2122  |  |            |
| 117      | Solder, Rosin Core   | QQ-S-571   |  |            |
| 118      | Solvent  | 1803C  | Goodyear Tire and Rubber Co., Inc.     |            |
| 119      | Solvent, Dry Cleaning (Stoddard Solvent)   | P-S-661, Type I; Stock No. W6850-264-9039  |  |            |
| 120      | Solvent, Safety—Mixture of the following specification compounds:<br>Dichloromethane, 25 % Vol;<br>Dry Cleaning Solvent, 70 % Vol;<br>Perchloroethylene, 5 % Vol | MIL-S-18718 (Aer); Stock No. R52-BUA-XAE-107-128<br>MIL-D-6998<br>P-S-661<br>O-P-191; Stock No. G5810-270-9982 |  |            |
| 121      | Stripper   | 2998   | Turco Products, Inc.                   |            |
| 122      | Styrene  | N-99 or equivalent   | Dow Corning Corp.                      |            |
| 123      | Synthetic Fiber, Nylon Cord  | MIL-C-572  |  |            |
| 124      | Tape, Adhesive, Pressure-sensitive, Water-resistant  | JAN-P-127, Type II, Grade B  |  |            |
| 125      | Tape, Adhesive, Rubber and Cork Composition  | MIL-T-6841   |  |            |
| 126      | Tape, Antichafing  | Scotchcal No. 455  | Minnesota Mining and Manufacturing Co. |            |
|          | Tape, Activator  | A-2  | Minnesota Mining and Manufacturing Co. |            |
| 127      | Tape, Glass Cloth, Pressure-sensitive, Flame-proof   | MIL-P-4053   |  |            |
| 128      | Tape Overcoating Compound  | EC-866   | Minnesota Mining and Manufacturing Co. |            |
| 129      | Tape, Vinyl  | No. 473  | Minnesota Mining and Manufacturing Co. |            |
| 130      | Thread Compound, Anti-seize and Sealing, Oxygen Systems  | MIL-T-5542; Stock No. R-8030-530-5234-G600   |  |            |
| 131      | Thread Compound, Anti-seize, Graphite-petrolatum   | MIL-T-5544; Stock No. R-8030-243-3285  |  |            |
| 132      | Toluene  | JAN-T-171; Stock No. W5610-281-2005  |  |            |

Section I  
Consumable Materials

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| ITEM NO. | NOMENCLATURE                             | SPECIFICATION OR STOCK NO.        | MANUFACTURER                               | SUBSTITUTE |
|----------|--|-----------------------------------|--|------------|
| 133      | Toluol (For Use in Organic Coatings)     | TT-T-548                          |  | JAN-T-171  |
| 134      | Trichloroethylene, Stabilized Degreasing | MIL-T-7003                        |  |            |
| 135      | Trisodium Phosphate                      | O-S-642; Stock No. G6810-240-2115 |  |            |
| 136      | Tubing, Semi-rigid Amber                 | NA2-4172                          | North American Aviation, Inc.              |            |
| 137      | Varglass Cord                            | 46                                |  |            |
| 138      | Varnish, Red                             | 1201 "Glyptal"                    |  |            |
| 139      | (Deleted.)                               |                                   |  |            |
| 140      | Cement, High-temperature                 | No. 32                            | Sauereisen Cements Co., Pittsburgh 15, Pa. |            |
| 141      | Flannel, Canton                          | CCC-F-451                         |  |            |
| 142      | Flannel, Outing                          | CCC-F-466; Stock No. R27-5-522    |  |            |
| 143      | Skins, Chamols                           | KK-S-416; Stock No. R34-5-494     |  |            |

**SERVICE CHANGE CHART****1-89. SERVICE CHANGE CHART.**

1-90. The following is a list of Service Changes which affect the FJ-4B. Sections of this handbook which contain the Service Changes are noted in the right-hand column. This list will be revised, if necessary, with revisions of the handbook to reflect current Service Changes.

| SERVICE<br>CHANGE<br>NO. | TITLE  | SECTIONS WHICH<br>CONTAIN SERVICE<br>CHANGE |
|--------------------------|--|---|
| 151                      | Removal of AN/ARN-14E and Installation of<br>AN/ARN-21 Radio Navigation Equipment                      | VIII, IX                                    |
| 374                      | Electrical Addition of Overvoltage Protection  | VI, VIII                                    |
| 447                      | Gun System—Test Receptacles  | VII   |
| 449                      | Relocates Aero 2A Gun Firing Control Panel   | VII   |
| 460                      | Continuous Oil Pressure Indicating System  | I, VI, VIII                                 |
| 461                      | Instruments — Installation of Interlock Relay for<br>Remote Attitude Indicator System                  | VI  |
| 462                      | Pneumatic System — Installation of Storage<br>Bottle Drain Line  | I, VII                                      |
| 473                      | Revise — Stores Emergency System   | VII   |
| 481*                     | Surface Controls — Revision of Directional<br>Longitudinal Trim Systems                                | II  |
| 482                      | Modification of Left-hand Universal Pylons<br>and MK-7 Pylons  | VII   |
| 493                      | Revision of Ammunition Booster<br>Motor Circuit  | VII   |
| 511                      | Fuel System — Modification of<br>Type II External Fuel Drop Tank<br>Release Mechanism and Adapter Beam | VII   |
| 513                      | Fuel System — Installation of IFR<br>Probe Extension   | VII   |
| 514                      |  | VIII  |
| 517                      |  | VI, VIII                                    |

\*Obsolete information caused by this Service Change coverage has been removed



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